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Edited by W. C. O'Kane

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By A. W. Richardson, Professor of Poultry Husbandry, New Hampshire College of Agriculture

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UNIV. OF
CALIFORNIA

A TYPICAL COMMERCIAL LAYING HOUSE

ONE TYPE OF MODERN COLONY HOUSE

HARPER'S HANDBOOKS

Edited by W. C. O'Kane

POULTRY

BY

A. W. RICHARDSON

Professor of Poultry Husbandry
New Hampshire College of Agriculture

HARPER & BROTHERS PUBLISHERS

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CHAPTER I. SELECTION OF STOCK

The Seven Fundamentals. The first factor to be considered in the success of any poultry business is the foundation stock. The kind of birds one will finally select will depend upon the type of business one wishes to go into, the market, the geographical location, and one's own personal preference. But there are certain fundamentals which every foundation stock must possess, and in the selection of any foundation stock these must always be considered.

These factors are seven in number, and are as follows: (1) Vigor, (2) Egg-laying Ability, (3) Size, (4) Climatic Conditions, (5) Freedom from Diseases, (6) Kind of Market, and (7) Type of Business.

1. Vigor. Egg production, fertility and hatchability all depend upon the health and vigor of the parent stock. It is plainly evident, therefore, that the birds should be strong and vigorous. They should come from stock that grows evenly, feathers well, grows rapidly, reaches maturity and begins to lay at five to five and one-half months. This is true whether the birds selected be Reds, Rocks, Wyandottes, or Leghorns.

If possible, the buyer should visit the plant from which he intends to purchase eggs or birds. He should make his visit at the time that the chickens are being grown. He should see the conditions under which the birds are housed because this will have a great bearing upon the vitality and health of the stock. He should know the conditions under which the chickens are grown—whether they are grown in small runs or on unrestricted range. This is because there is

a great difference in the chickens that are grown under the two conditions, the unrestricted-range chickens being superior in every way to chickens grown in confinement. Especially is this true after four or five successive generations grown on unrestricted range.

2. **Egg-laying Ability.** The birds should have in their make-up the power of high egg production. High egg production is inherited. It is passed down from the parent stock to the next generation. Therefore, we should know the parentage of the birds or eggs we wish to purchase.

If possible, the stock should be purchased from some grower who has shown a willingness to enter his birds for successive years in egg-laying contests. The reason is that most of the men who are doing this are growers who are giving special attention to trap-nesting and pedigreeing of their birds, in order to build up a stock that will lay heavily. Even though the grower may never have been a winner at a contest, yet his stock usually is away above the average in egg production.

When we consider that the average production of eggs on the general farm in the eastern United States is approximately seventy-five eggs per hen per year, and then discover that many of the successful chicken men in that same area are getting an average of one hundred and forty eggs per hen per year, and are doing this with flocks of ten hundred, twelve hundred and fifteen hundred hens, we can see that there must be a great deal in the selection of the stock. A grower can afford to pay a higher price for foundation stock coming from strong, vigorous, thrifty birds which have been bred to produce eggs. Under prevailing prices a flock laying eleven dozen eggs per hen per year will yield a return of fifty to sixty cents more per hen than a flock which is laying ten dozen eggs per hen per year. Yet it will take practically no more feed to produce the eleven dozen eggs from the one flock than it will to produce ten dozen eggs from the other flock, and it certainly takes no more time to take care of the birds nor any more money invested in the equipment.

One other advantage that the practical

poultryman may derive from the purchase of high-producing stock is this—that if he, himself, is able to reproduce that stock and get hens that will lay large numbers of eggs, he is in a position to sell eggs for hatching and stock for breeding to other men going into the chicken business or to his neighbors who have been less fortunate in the selection of their stock.

3. Size. One might expect that size would more or less correspond to vigor, but this is not necessarily true. A man may have so bred and so fed his stock that while it possesses vigor and vitality, the birds will average too small. We should avoid the selection of any foundation stock which is undersize when it reaches maturity, according to the best standards of the breed or variety chosen. A practical poultryman finds that there is comparatively little difference in the actual cost of feeding a pullet which weighs four and three-quarter pounds at maturity as compared with another pullet which weighs five or five and one-quarter pounds at maturity. But there is a big difference in the yearly income from several hun-

dred hens between birds which will average large and those which run small.

4. Climatic Conditions. The geographical location or climatic conditions of the place where the man intends to go into business must be considered in selecting the foundation stock. The smaller birds, such as Leghorns, Anconas, and Andalusians, are closely feathered and originated in a comparatively warm climate. These breeds will not stand up and lay uniformly through the winter in the northern parts of our country where the winters are long and severe. This type of bird is a good producer of eggs in a climate where the winters are more open, as, for example, in the southern part of New England, New York, New Jersey, and other places throughout the country which have approximately the same climate. The Reds, Rocks, and Wyandottes are a looser-feathered type of fowl, are larger, can withstand the cold and are better adapted to the colder climate. Their egg production is not materially affected by the cold weather. It takes prolonged cold, such as ten or fifteen degrees below zero or lower, to materially affect the

production of this type of hen, if they are kept in condition and in the proper type of houses. Any man who is contemplating going into the chicken business should choose such breeds as Reds, Rocks, or Wyandottes for the colder climates; and such as Leghorns, Andalusians, or Anconas for locations where the winters are not severe.

5. Freedom from Diseases. It is believed by competent poultrymen to-day that there are very few diseases of fowls which are actually inherited. Nevertheless, there are several diseases which affect the value of fowls as foundation stock.

The one particular disease which every poultryman should avoid, and which can easily be avoided, is white diarrhea. From the scientist's point of view this disease cannot be inherited, technically speaking, yet from the practical poultryman's standpoint, it amounts to the same thing because the germs of the disease are carried by the yolk of the egg, and when the egg is incubated the yolk passes into the digestive system of the young chick, thus infecting it with the disease.

There has been perfected a test by which

the fowls that are carriers of this disease can be detected and eliminated from any breeding flock. The test is practical and accurate, and the man who intends to buy foundation stock with which to start in the chicken business should buy only stock which has been tested for several generations for white diarrhea and which has been found free upon each test or which at least has been found free for two consecutive generations. The buyer should lay particular stress upon this factor because there probably is no disease which carries off so many young chickens as white diarrhea. There is no known cure for it. Once established in a man's flock the disease will do more to discourage him and cause him to go out of the business than any other single factor.

Foundation stock should be free from such diseases as roup, canker, and tuberculosis. While these diseases may not be transmitted from the parent stock to the chickens, yet there is at least a strong possibility that such stock will transfer a lower vitality to the chicks and the chicks are then susceptible to the disease.

6. Market. The color of the egg demanded by the market in which the poultryman wishes to sell his products will have a bearing on the selection of his stock. The New York markets, for example, demand a white egg, and this must be produced by such hens as Leghorns or similar breeds; whereas the Boston and other New England markets demand a brown egg, which is produced by such hens as Reds, Rocks, and Wyandottes. In each case, both the white egg in the New York market and the brown egg in the New England market command a higher price than the egg of the other colored shell. A poultryman should ascertain what type of egg sells best in his market and should make every effort possible to produce that type.

7. The Type of Business. There are several different types of poultry business which a man may go into. It will be wise to consider carefully this factor before choosing foundation stock. If the poultryman is going to produce capons he will want a breed that will grow to a comparatively large size, such breeds as Rocks or Brahmas. If he is

going into the broiler business as a separate business he would again choose such breeds as Rocks or Wyandottes. The majority of successful poultrymen, however, are making the most of their money out of table eggs, and this should be the type of business that any man except a specialist should elect.

Unless he is very familiar with the poultry business he will be better off to avoid any phase of the business that is not generally considered as good, sound poultry practice in the conduct of a standard poultry plant: such as, for instance, the hatching of chickens in September, October, or November, with the idea of getting the birds onto the market as broilers in the winter when the price may be high. The market for such a type of product is limited and there are many handicaps that a man must overcome if he is going to make this type of business successful.

Summary. To sum up the selection of stock: The stock should have vigor, should have the size best suited to the breed, should be adapted to the climate, should above all things be free from diseases, should have big egg-laying quality in its make-up, should

produce the type of egg that is demanded in the local market, and the business should be established and built up upon good, sound poultry practice. The best way to be sure of the foundation stock will be to write to the experiment station or state college and get from them a list of breeders whose stock the college can stand behind and recommend.

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CHAPTER II. INCUBATION

Incubator vs. Hens. Having chosen the foundation stock and being ready to reproduce this stock in the form of young chicks for the approaching season, one must consider the question of incubation. There is always some discussion as to the relative merits of hen-hatching and incubator-hatching. The consensus of opinion among poultrymen is that a man in the commercial hen business cannot afford to bother with setting hens. The time that he puts into it is too

costly. Also, the time that the hens themselves lose would make his chickens cost much more than would be the case if they were hatched in incubators, because the hens can be broken up from their desire to set, and can be restored to laying conditions. With that accomplished they will produce more eggs and pay such a profit that they cannot possibly be considered as economical hatchers.

It is now believed that incubator chicks are just as strong and healthy as hen-hatched chicks. Since the incubator does not hatch quite as many chicks from a given number of eggs as do hens which are properly set, it is possible or even probable that there is some elimination in the incubator of the weaker germ. If this is true, the chicks that are hatched in an incubator should prove to be better than the chicks hatched by a hen.

Selecting Eggs for Hatching. The eggs to be saved for hatching should be alike in size and color. It is considered that uniformity of size and color are factors which may be inherited through the egg, and, of

course, we wish our hens to lay the same size egg as far as possible, and the same shade of brown or the same degree of whiteness. They should be free from ridges. They should be candled before a strong light to remove any that show blood spots or meat spots, because such eggs will never hatch. Any that show fine cracks should be removed, because these will seldom hatch and in any event are very likely to become broken in turning. All eggs that are extremely long or extremely short should also be discarded.

Effect of Storage. The hatchability of eggs is materially less after they are several days old. Eggs should not be saved, unless under special circumstances, for more than ten days. If the operator is trap-nesting his hens, or if he has certain hens that he knows to be unusually high producers, the eggs from these birds may be saved three weeks; but they should be turned once a day after they are four or five days old. While the per cent of hatch from these old eggs will be small, the chicks which come from them will be worth more to the grower than the eggs would be worth if they were sold to eat.

How to Store. Care should be taken to see that the eggs, during the time they are being saved, are stored in a place that is not too dry and at a temperature around 55° to 60° F. If they are kept at a much lower temperature the germs may be weakened and may not hatch well, or may not hatch at all. If they are kept at a much higher temperature they are likely to start to develop. In that case, after being placed in the incubator and kept there for several days, they will die.

When to Hatch. The best time of year to hatch chicks is early in the season—from the first week in March to about the 20th of April. This is true even in locations where there may be snow on the ground at the time the chickens are hatched, because the chicks that are hatched early are inherently better chicks. If we are saving hatching eggs from a flock of hens and pullets in February or March we are getting them from the best birds in the flock, because only the best are producing eggs. The chicks that they produce will be strong and vigorous; whereas, if we save eggs from either hens or pullets in April or May we are saving eggs during the

time of natural heavy production, when practically all of the flock are laying—good, bad, and indifferent—and, therefore, we are getting a large percentage of our eggs from the average and poor producers. This is especially apt to be true because the heavy-laying hens are likely to be going through their first broody period at that time. Under these conditions the later-hatched pullets are not as good and never will be as good as the early-hatched chicks. They will not make as rapid growth because they are not inherently as good chicks.

Advantages of Early Chicks. If they are hatched early they will become well feathered before hot weather arrives and will be protected from the heat by feathers. They will make a rapid, normal growth. Whereas, if they are hatched later they will not be as completely feathered, will not have protection from the extreme heat and will not make the same growth.

If the operator will compare a flock of chickens hatched the 20th of March and another flock hatched six weeks later, he will find that there will be considerably more than

six weeks difference in the time of reaching maturity. The early hatched chickens will probably reach maturity at approximately five months, while the later-hatched chickens, in all probability, will require two or three weeks longer. The late-hatched chickens will not make as uniform growth; they will exhibit more runts and improperly developed chickens, there will be some chickens that are poorly feathered, and, taken all in all, they will be a poor lot.

Selection of Incubator. In the selection of an incubator there is one prime rule to follow: Buy a good, standard make of machine. Do not buy a cheap, poorly constructed machine, because in the long run they are the most expensive. They are more apt to get out of order and they are not as substantially built. An occasional poor hatch will more than make up the difference between the cost of a cheap machine and that of a better, higher-priced, standard make.

Location of Incubator. The best place to run an incubator is in a cellar. Here the temperature is more nearly uniform. If the surroundings are free from marked fluctua-

tions it will be easier to maintain an even temperature within the machine, and the better this is accomplished the better the eggs will hatch.

The Oil to Use. If the machine uses oil for fuel—and most of the smaller machines do—care must be taken to purchase the best grade of oil that can be obtained. Since the lamps in an incubator are forced to run straight through every hour in the twenty-four through a period of twenty-three or twenty-four days, it stands to reason that only the best oil should be purchased. If a poor oil is used the wicks become charred and covered with carbon, they are very likely to flare up, depositing soot on the interior of the chimney, the lamps become intensely hot and may set fire to the machine. Incidentally, the house may be set on fire. Even though the machine is closely watched, it is more difficult to obtain a uniform temperature with poor oil than with good oil. While a good oil may cost several cents more per gallon, it will be well worth the added price.

Setting Up the Machine. In buying any make of machine, follow as far as pos-

sible the maker's directions for setting up the machine and for running it. It should, of course, first be leveled. If this is not done one corner may be higher than the others, with the result that the part that is higher will also be hotter and the eggs in various parts of the machine will not be getting the same degree of temperature. Some will be too hot and others will be too cold.

Trying It Out. Whether the machine is new or second-hand, it should be run several days to see that it will run accurately. If a second-hand machine is used, care should be taken to see that the rod which connects the thermostat with the damper arm is perfectly straight. If this is at all bent, the rod may bind as it passes through the little hole in the top of the machine and cause the damper arm to stay down, or it may lift the damper arm and hold it lifted, so that it will be impossible to run the temperature evenly. If the machine is run several days before placing the eggs in it, the operator will have a chance to find out whether all the parts are perfect. At least two days should be allowed for getting the machine warmed up.

Care of the Lamp. The lamp should be filled and trimmed once each day. The lamp should not be filled nearer than half an inch from the top, and if any oil has been spilled on the lamp it should be thoroughly wiped off so as to avoid any possibility of smoking. This should not be done until after the eggs have been handled, because, if the operator in caring for the lamps gets any oil or soot upon the hands, it is very likely to get onto the eggs and affect the hatch.

Providing Moisture. Many of the present-day incubators are supplied with a moisture pan. This pan should be filled with sand and kept moist from the time the machine is first started, in order that all the conditions may be the same in regulating the machine as they will be after the eggs are put into it. If the machine is not equipped with moisture pans, in most climates and in most cellars it will be well to use several tin pie plates filled with sand and water and placed on the floor of the incubator, underneath the egg tray, being very careful, however, not to set the pans over any opening which may be used in ventilating the ma-

chine. These pans should be kept in the machine until the hatch is entirely over.

The Right Temperature. Temperature probably has as much to do with good hatches as any other single factor. If the incubator comes equipped with a thermometer which is so arranged that the bulb rests on or near the eggs, the machine should be adjusted to run at 101° the first week, 102° the second, and 103° the third. If the thermometer used is arranged to hang with the bulb suspended perhaps one-half inch above the eggs, then the temperature should read 103° for the entire three weeks. In either case, regardless of the type of thermometer used, the temperature should be allowed to rise to 104° or 105° from the time the chicks pip the shell until the hatch is over.

Close of the Incubator Period. If all the conditions previous to the hatching of the eggs have been correct and the temperature of the machine has been constant, the hatch should be entirely over at twenty to twenty and one-half days. If the temperature is allowed to drop at all during these last two days, known as the exclusion period,

the chicks are very likely to die in the shell. Also, if the moisture pan is taken out of the incubator at this time or at the beginning of the exclusion period, the inner shell membrane becomes very dry, hard, and brittle, and the chick will have difficulty in picking its way out of the shell. The shell membrane may stick to the back of the chicks, or the chicks' intestines may be entirely pulled up from being attached to this dry inner membrane.

Turning the Eggs. The eggs should be turned at the end of twelve hours after they are put in the machine. In other words, if they are put in the machine at eight or nine o'clock in the morning they should be turned for the first time at eight or nine at night. The proper way to turn eggs is as follows: One end of the tray or trays should be marked with a pencil. Two or three rows of eggs should be taken from that end of the tray and placed at one side. With the palm of the hands, the remaining eggs in the tray should then be rolled toward the mark on the tray. Each time the eggs are turned this same procedure should be followed, removing

one or two rows at the marked end of the trays and rolling the rest toward that end. By following this system of turning, at the end of two or three days the eggs will have passed directly across the tray and will have occupied every possible variation of temperature which may be present in the machine. After the first twelve hours the eggs should be turned three times daily—6 A.M., 12 noon, and at 6 P.M.—until a chick is found to have pipped the shell; then the turning should cease.

Ventilation. In the average house cellar where the ventilation is good, it will not be necessary to take the eggs out of the machine and allow them to set for any length of time merely to cool them. The ventilation of a cellar may be judged by the presence or absence of odors. In the older types of incubators, where the ventilation problem had not been seriously considered, or in some cellars where the ventilation is insufficient, it may be necessary to cool the eggs; but under most conditions it will not be necessary. The eggs, of course, will have to be taken out of the machine to turn them,

and this will give them sufficient cooling. During the time when the eggs are being turned the door of the incubator may be left open and this will aid in airing out the machine. It will, of course, lower the temperature, but only for a short time, and should have no ill effect upon the hatch. If anything, it will be beneficial.

Care at Hatching. When the first chick pips the shell the thermometer, if of the standing type, should be tied down adjacent to the second row of eggs from the door, so that the chicks in scrambling around will not tip it over and so that the operator can watch the temperature. The moisture pans should be filled, the machine closed up, and if there is not an outside wooden door, a bag or something similar should be hung over the front of the machine to exclude any light; otherwise the chicks that have hatched will come forward to the light and crowd. The machine should not be opened again until the hatch is entirely over, at the end of twenty or twenty-one days.

Removing to Nursery. At that time the door should be opened, the moisture pans re-

moved, a burlap frame placed in the bottom of the nursery, and the chicks removed by hand from the egg tray to the nursery. They should not be allowed to drop down to the nursery floor, because the change in temperature is too great, especially if the chicks are not hardened off, and the fall may be injurious. After the chicks have been transferred to the nursery the egg tray should be taken out, thoroughly washed with some good disinfectant, and placed in the sun to dry. Any ventilators on the machine should be opened wide and the door should be fastened so that there will be an opening an inch wide at the top. The chicks should then be kept in the nursery, given no feed nor water for at least thirty-six hours, to thoroughly harden them off and get them ready for transfer to the brooder.

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CHAPTER III. BROODING

Size of Brooder House. The first thing to consider in planning for the brooding of chicks is the brooder house. The house should be large enough to permit the stove to be set one-third of the way from the back wall and at the same time leave plenty of room in the front of the house for the chicks to exercise in. The depth from front to

rear should be such that the front third will be cool and at times even cold. The secret of the proper brooding of chicks is to maintain a temperature under or near the hover sufficiently high to insure that the chicks will be warmed up quickly, while at the same time they have ready access to quarters that are considerably cooler. This makes it possible to harden them off.

One Room Best. It is better to have the cool area and the warm area all in one room, so that the chicks, when they are running around where it is cold, may constantly see the stove and the other chicks. They will then readily go back and get warmed up when they grow too cool. If the brooding arrangements are in two rooms it will be necessary to teach them to go in and out through an opening. Of necessity this opening must be small. The chicks may get too far away from the opening and become lost, because they cannot see or feel the source of heat, or see other chicks.

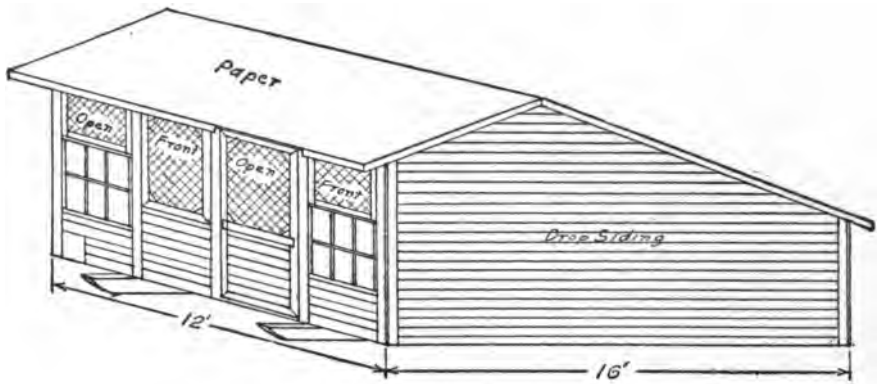
Construction of House. The brooder house should be twelve feet wide and sixteen feet deep. The roosts and dropping boards

should be permanent, with the roosts so hinged that they can be tipped up out of the way during the brooding season. There should be an open front at least two and one-half feet high and extending clear across the front. This open front should start at the plate, or, in other words, as high up in the front as is possible, so that the sunlight and fresh air will penetrate to the back part of the house.

The door should be built directly in the middle of the front of the house. The upper half of the door should be an open space. At the bottom of this open space a slanting water table or board should be arranged so as to carry off rain which may spatter down from the roof. The eaves, both front and back, but especially at the front, should extend out over the studs at least a foot.

The dropping board is used during the brooding period for the storage of coal and grain. If the grain is stored there, including rolled oats, chick feed, and mash, it will save the operator many steps.

Windows and Curtain. Two windows should be placed at either end of the front.

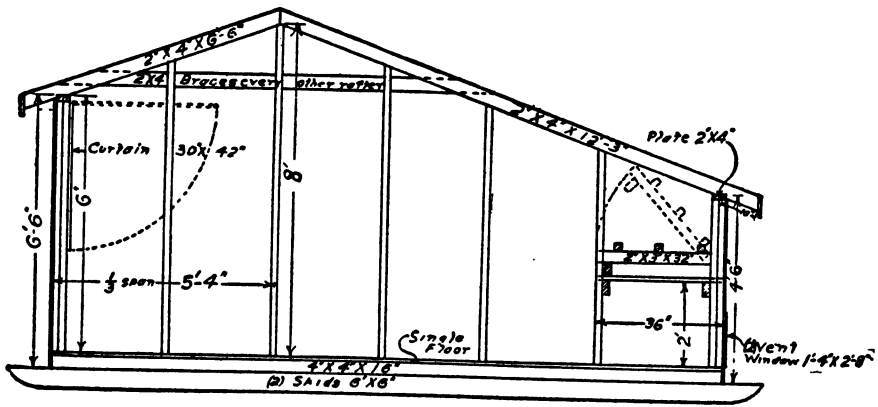


FRONT AND END VIEW OF BROODER HOUSE

This will give plenty of light during the time that it is necessary to have the open fronts covered with a curtain. This curtain should be made of thin cotton cloth, such as sheeting. White cloth bagging, such as rolled oats come in, may be used. The curtain should be closed during the night in March and April. Until the chicks are ten days old it should not be raised until eight o'clock, and it should be closed down about four, when the day begins to cool off.

Details of Construction. The brooder house should be set on six-by-six skids, so that it may easily be moved. An average pair of farm horses can move the house described here without difficulty. The house should be portable because it is desirable that the chickens should not be allowed to run on the same ground year in and year out.

The roof is of the type known as a two-thirds span, which means that the front rafters are half as long as the rear rafters. The building is made comparatively low behind to lessen the cost and to make it warmer and lighter. It is covered with ordinary drop siding or ship-lap, which is



FRAMING OF BROODER HOUSE

tongued and grooved. This affords a building that is light and at the same time tight. Incidentally, the building has a good appearance. This type of wall is but little more expensive than ordinary boards covered with roofing paper and it will give much better satisfaction.

The floor is made of single matched flooring. If well laid it will serve just as well as a double floor because there should always be abundant litter on the floor, and thus no cold air can get through from beneath.

The Brooder Stove. There are on the market several makes of coal-burning brooder stoves, practically all of which are good. This is the type of brooder stove that will give best results. In a house of the dimensions described here, four hundred to five hundred chickens can be brooded. With a brood of this size the stove should have a hover, or canopy, at least fifty-two inches in diameter.

In making calculations to brood from four hundred to five hundred chickens in each lot care should be taken that the eggs be set in multiples of approximately eight hundred.

With good stock and proper incubators a poultryman should get a hatch of about 55 per cent. Thus he will have a reasonable margin to go on. For example, if he gets a 60-per-cent hatch he will have four hundred and eighty chicks, which will be fairly within the capacity of his brooder house. If he gets a poor hatch of, say, 45 per cent, he will have three hundred and sixty chicks, which will make a comfortable brood. In other words, his incubating should be so planned that each hatch will furnish one good brood of chicks. Early-hatched chicks require a larger stove in proportion than late-hatched chicks; thus a forty-two to forty-eight inch hover will be large enough for a brood of four hundred in April or May.

Arrangement of Chimney. Care should be taken to see that the chimney extends at least a foot and a half above the ridgepole, in order that there may be a good draught, regardless of the direction of the wind. A certain amount of creosote is very likely to be deposited on the interior of any metal chimney. Occasionally the chimney should be taken off the stove, swung to one side,

and tapped with the poker or shaker, to make certain that it shall not become clogged up, as frequently happens if the operator is careless or ignorant. It will be well to have a metal cap four or five inches above the top of the chimney to keep out direct rains or storms.

Management of Stove. A half ton of coal is usually sufficient to carry through each brood of chicks. This may be placed in the brooder house at any time that is convenient. Each house should be equipped with its own shaker, poker, and fire shovel. When the ashes are shaken down from the stove the pan containing them should be placed on the dropping board and allowed to become cold. Then they should be dumped on the floor of the brooder house. Chickens like coal ashes and the ashes are good for them. This may look like carelessness or negligence on the part of the operator, but it really is good practice.

When the chicks cease to need heat, the stove can be taken down, thoroughly cleaned out, painted with some stove paint, and set on a shelf on the wall of the brooder house,

a foot and a half above the floor. The stovepipe may be pulled down through the opening in the roof, cleaned, and put up by the stove. The opening in the roof may then be covered with roofing paper so that it shall be tight.

Feed Trays. The feed trays which are used for the small chicks up to the time they are eight weeks old may be made of a board a foot wide and two feet long, with laths or narrow strips nailed around the outer edges. It is necessary, of course, that the chicks be able to get at the grain readily. While they may soil the grain in such a tray, this will be offset by the fact that the chicks will have easy access to the feed. This is essential.

Providing Gravel. Before the chicks are transferred from the incubator to the brooder house enough fine gravel—not sand—should be put in the house to cover the floor one-half inch deep. A fire should be built in the brooder stove so that this gravel will be thoroughly dried out and warmed and will give the operator a chance to regulate the stove. On top of this gravel should be placed a layer of chaff from the barn or finely cut

clover or alfalfa. This chaff or litter should be swept off and removed about once a week and a new coating put on.

Temperature of Brooder. During the first ten days after the chicks are placed in the brooder house the temperature should be 100°, two inches from the floor at the outer edge of the hover. It should be lowered about five degrees a week until the time comes when the chicks will need no heat. For early-hatched chicks this will be about ten weeks, for later-hatched chickens about eight weeks.

Transferring Chicks. When the chicks are transferred from the incubator they should be kept covered with flannel or something of that kind so that they will run no risk of being chilled. Just before they are placed in the hover, their bills should be dipped in sour skim milk or buttermilk, so that every chick is forced to swallow a drop or two. Sour skim milk or buttermilk aids in the digestion of the chick's food and helps it to adjust itself to the poultryman's system of feeding.

After the chicks are all in the hover, a

strip of woven wire about twelve inches high should be placed around the hover about a foot outside of its circumference. This is for the purpose of confining the chicks near the brooder for the first thirty-six hours until they become hover-broken. During this time they should have constant access to sour skim milk or buttermilk. No other food should be given. If milk is available no water is necessary.

Early Feeding of Chicks. At the end of thirty-six hours the wire fence may be removed and the chicks given a light feeding of dry rolled oats, the same as used for human consumption. The next feed should be ordinary commercial chick feed. They should be fed six times a day for the first fourteen days on these two feeds, three feedings of rolled oats and three of the chick feed, fed alternately. Enough at each feeding should be given so that the chicks will be ten or fifteen minutes eating it up. They should be hungry when the next feed is given.

At the fourteenth or fifteenth day a little dry mash of the following formula should be given in tin pie plates or on boards or

shingles: one hundred pounds each of corn meal or hominy feed, bran, white middlings, gluten feed, meat scraps, and ninety pounds of rolled oats. This should be left before the chicks fifteen or twenty minutes in the afternoon. The next day it should again be placed before them for perhaps a half hour in the morning and a half hour in the afternoon. On succeeding days the time should be gradually increased so that by the time the chicks are three weeks old the dry mash is constantly before them. From the time the chicks are three weeks old until they are approximately eight weeks old the amount of chick feed given them should be so regulated that they will be getting half chick feed and half dry mash, by weight. For further instructions on summer feeding of chicks, see the succeeding chapter.

Value of Milk. The question is frequently asked, "How long can one afford to buy milk to feed the chicks?" If skim milk or buttermilk can be purchased for two cents or less per quart, the poultryman can afford to feed this all summer. Even if it is necessary to pay a higher price for skim milk it

should be fed without fail until the chicks are four weeks old. In fact, rather than omit this item of their diet the poultryman can profitably go to the extent of buying whole milk, skimming the cream (using it in the house), souring the skim milk, and feeding this sour skim milk to the chicks. There is no feed that will give chicks as good a start as milk. Chicks fed on milk will grow faster and more uniformly, will suffer materially less mortality, and will exhibit fewer runts or poor chicks. They will reach the broiler age much sooner and, therefore, will be worth more, because during the summer the broiler prices drop rapidly and the sooner one gets his broilers on the market the more profit there is in the business.

Outdoor Exercise. Every effort should be made to get the chicks out onto the ground by the time they are eight or nine days old. Small, portable yards made of one-foot-wide inch-mesh wire, nailed onto two-inch strips ten or twelve feet long, make good yards. They are easy to step over and are plenty high enough to confine small chicks.

The day selected for the first outdoor exercise of the chicks should be, if possible, warm and sunny. The chicks should be gotten out about ten o'clock in the forenoon, and, incidentally, at about feeding time. The door leading into the yard should be opened, every chick driven outdoors, and the door closed. Then the chicks should be fed their rolled oats or chick feed outdoors. This will keep them busy, active, and contented for a little time, even on a cold, raw day.

After the chicks have eaten their fill, and whenever they begin to peep and appear cold, open the door and drive them all back in again, every chick. This should be done again that same afternoon, about two or three o'clock, while the day is still warm. If this process is followed for about three days, then the chicks will go in and out of their own accord and go readily.

Care should be taken to see that the run from the brooder house to the ground be just as low and as gradual as possible. This may be accomplished by using sods or earth and building a gradual runway. A steep

board runway should never be used, because the chicks will not go up and down readily.

Removing Fence. When the chicks are large enough to fly over the temporary fence the fence can be removed and the chicks allowed to run at large. After the chicks have been outdoors in the yard several days all of their feed hoppers and milk dishes should be placed outdoors, and every inducement made to get the chicks out and keep them out. If this is done the chicks will be hardy and will never become so-called hothouse chickens.

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CHAPTER IV. SUMMER FEEDING

Scratch Feed and Dry Mash. In order that chickens shall make the most rapid and efficient growth, they should be furnished during their entire growing period with approximately half scratch feed and half dry mash by weight. This is of special importance from the time the chicks are eight or ten weeks old until maturity. The change

from chick feed to the scratch feed should be made when the chicks are eight to ten weeks old, and about a week should be occupied in making the change.

Scratch feed should consist of equal parts by weight of cracked corn, wheat, and oats. This feed should be fed twice a day—half in the morning and half at night.

How to Adjust Feeding. It will not be at all difficult to adjust the scratch feed so that the mash and scratch shall be equally divided. If the chickens eat fifty pounds, for example, of mash one week they should receive fifty pounds of scratch the succeeding week, or approximately seven pounds per day. If in some succeeding week the chickens eat one hundred pounds of mash in a week, they should receive the following week one hundred pounds of scratch feed, or approximately fourteen pounds per day.

Avoid Undue Forcing. By feeding the chickens in this manner, they will not be unduly forced into egg production. It is possible to feed pullets so they will reach maturity, as far as egg production is concerned, before they reach maturity in size.

While they will lay, and while some will lay large numbers of eggs, yet the tendency of these pullets is always to lay a comparatively small egg. Of course, the tendency is that the pullets themselves will never be as large as they might have been.

Milk. If milk in some form is available after the chickens are eight or ten weeks old, the meat-scrap content of the mash should be cut in two. In other words, fifty pounds will replace the one hundred pounds given in the original formula.

How to Feed. The scratch feed should be fed on the ground and scattered over as great an area as possible. It should be fed at some distance away from the house. Scratch feed should never be fed so liberally as to lie on the ground from one feeding time to the next. The chickens should clean up each feeding in an hour or less.

The dry-mash hoppers should be constructed so that the mash will not get damp. The roof of the hopper should extend out over the hopper itself at least a foot on each side so that the chickens may stand under there and eat, even if it is raining hard outside.

Semi-solid Buttermilk. If a good range is furnished it will not be necessary to give any other form of green feed. If the range is somewhat scanty, or, in other words, if the grass is pretty well eaten down, every effort should be made to use milk in some form.

For the average commercial chicken man, or for the man who keeps only a few chickens, there is no milk product on the market which is more easily handled and which is lower in price than semi-solid buttermilk. It should be fed daily to chickens eight or ten weeks old at the rate of two pounds to every five hundred pounds of chickens. It should be fed on boards or in a trough, just as it comes from the barrel. It will not be necessary to dilute it with water. The chickens will eat it more readily than they will drink it if diluted with water, and the labor of feeding it is much less when it is fed as it comes from the barrel.

Reducing Beef Scrap. If the semi-solid buttermilk is fed to the chickens at the rate given, the beef scraps in the dry-mash formula should be cut in two, or in other

words, fifty pounds instead of one hundred; and this semi-solid buttermilk should be fed all summer. While semi-solid buttermilk may not entirely take the place of green feed, it will materially help. It has been found that chickens ranged considerably less when fed on milk and ate down the grass on their range very much less—an indication that milk will take the place of the green feed for growing chicks.

Selling Off Broilers. Just as soon as the chickens reach two pounds the male birds, after the breeders have been picked out, should be shipped to market. There is no time when a chicken will pay as great a percentage of profit over and above its feed cost as it will when it is disposed of as a two-pound broiler. The man who keeps his male birds until they reach the roasting size—five, six, and seven pounds—does not make as much money on each individual chicken as he would have if he disposed of it as a broiler. Also, he has added to his cost of labor in caring for the chickens, he has added to his risk, and of course he has added to his housing costs.

Roosts In Brooder House. Assuming that the male birds have been taken out of a brood of four hundred to five hundred chickens, and the mortality has been approximately 10 per cent, which is average under ordinary conditions, there will be left approximately two hundred to two hundred and twenty-five pullets in the house. This will be a satisfactory and manageable number.

Whenever the pullets begin to show a desire to roost, additional temporary roosting poles should be placed in the building so that all the birds will learn to go to roost. If some of them are obliged to remain on the floor, there will be difficulty in teaching them to go to roost when they are transferred to winter quarters. This will be avoided by seeing to it that there are enough roosts in the brooder house.

Cleanliness. The brooder house should be cleaned out at least once a week during the summer. It should be sprayed every two or three weeks with a strong solution of some good coal-tar spray. Any of the standard commercial sprays on the market will be satisfactory. After the house, the floor, and

dropping boards have been cleaned a thin sprinkling of sand should be placed on the floor and dropping boards so that the droppings will not stick and the house can be kept much cleaner.

Shade. If possible the brooder house should be located in an orchard or some place where there is natural shade. If not, some effort should be made to furnish shade.

The easiest way to furnish shade to growing chickens is to plant corn. The chickens, as a rule, will not disturb the corn, even when it is small. After it gets to be a foot high the chickens will spend a great deal of time in the corn, will get all the shade they will need, will have a chance to dig and burrow and will, of course, get some grubs and insects. The corn may be ripened and picked off and used as feed. The cornstalks may be allowed to dry thoroughly and may then be cut up into short lengths and used as litter in the henhouse the succeeding winter.

Water. If no liquid milk is available there should be a constant supply of fresh, and if possible, cold water. If running water is to be had this may be accomplished by

laying a pipe two or three inches underground. The simplest way to lay such a pipe is to plow a furrow, place the pipe, and plow the earth back. This arrangement keeps the pipe and water cool. If the water is allowed to drip slowly into a tub or trough there will not be any muddy place around the drinking fountain. At the same time there will be an ample supply of cool, fresh water. When the pullets are taken from the range and placed in winter quarters, the pipe may be disconnected and pulled up without any difficulty.

Late Summer Feeding. It has been observed that a pullet that is about to lay, or one that has just begun to lay, is characteristically fat. This excess of fat in the pullet is used by her as a surplus to carry her through the cold winter months. It should be the aim of the poultryman to get an ample amount of this fat on the body of his pullets before they are placed in winter quarters.

About two weeks before the pullets are ready to lay the following change in feeding should be made. Instead of providing half

scratch feed and half mash, as was done previously, the quantity of scratch feed should be materially increased, so that the pullets are getting at least two times as much scratch feed by weight as mash. This is done because the body-maintenance or fat-forming ingredients are in the scratch feed and it is desired to push along the body development. The pullets should be induced to eat all the scratch feed they will eat without leaving any on the ground.

It is not difficult to tell when the pullets are ready to lay. They will begin to show the matronlylike appearance of a hen, their comb and wattles will begin to redden and develop, they begin to sing, and they become very tame.

Directions for the housing and management of pullets in winter quarters will be given in the chapter on Management.

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CHAPTER V. HOUSING

FROM the time they are ready to lay eggs, on through the rest of their life, pullets will be confined in a laying house or henhouse.

Regardless of the style of house, its size, or the climate in which it is to be built, there are several features which must be taken into account. These are as follows: (1) Fresh Air, (2) Sunlight, (3) Cost, (4) Ease of Cleanliness, (5) Convenience.

Fresh Air. It is absolutely necessary that fresh air in abundance be present in a henhouse. This is due to a simple and

easily understood fact. Since a hen has no urinary apparatus it is necessary that all of the moisture which she takes into her body in the form of water or in her feed be given off with the breath from the lungs. Thus hens require five times as many cubic feet of air per pound of live weight for proper maintenance of life as any other domestic animal.

Too Much Moisture. If there is not sufficient ventilation in the house the air becomes laden with moisture. This moisture settles toward the floor, has a tendency to wet the litter, and collects on the glass and on the walls and roof. When cold weather comes this moisture will be deposited as frost. During the middle of the day, when the henhouse warms up, this frost will melt, run down on the floor, and cause the litter to be even damper than in summer.

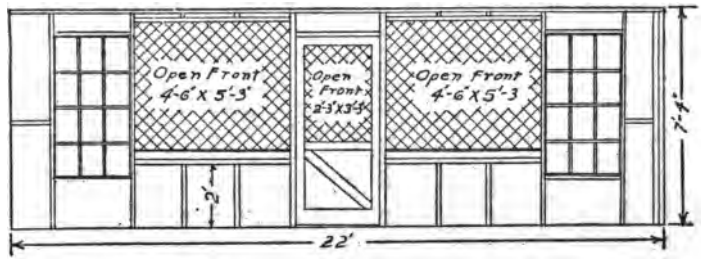
If a henhouse is damp, the hen's breathing apparatus has to work harder than it should. She is more susceptible to colds and to all kinds of digestive disorders.

Open Front Best Plan. There is, of course, a difference between fresh air and

A 1000 Bird Laying House And Feed Room

Laying House 6 Pens Each 22'X22'

Feed Room Two Floors 40'X40'



FRONT ELEVATION OF LAYING HOUSE

draughts. There should be no draughts in a henhouse, especially in winter.

The best way to get fresh air into a henhouse is through an open front. This open front should extend downward from the eaves to about two and one-half feet from the floor, and lengthwise to a window at either end of the house, as described in the next paragraphs. Its area should be one-sixth that of the floor area of the house.

The reason for having the open front as high as possible is to allow the air to come in at a high level. It will then go farther back into the house, and therefore give better ventilation all over the house.

Sunlight. Sunlight, being one of nature's best disinfectants, should have ample access to the interior of a henhouse. Sunlight, of course, will come into the henhouse through the open front. Therefore, the open front should be on the south side of the house. In a henhouse from twelve to twenty-four feet in length there should be two windows. These windows should be placed on the south side, at the extreme right and extreme left of the front. These, like the open front,

should be placed high up in the front of the building so as to get the sunlight as far back into the house as possible.

The windows that are recommended are the ordinary stock sash. They should be screwed or nailed to the studding, because it is not necessary that these windows be opened at any time. Any window that opens or swings is much more likely to be broken than one that is permanent.

On stormy days it is intended that the open fronts should be covered with their curtains made of thin cotton cloth.

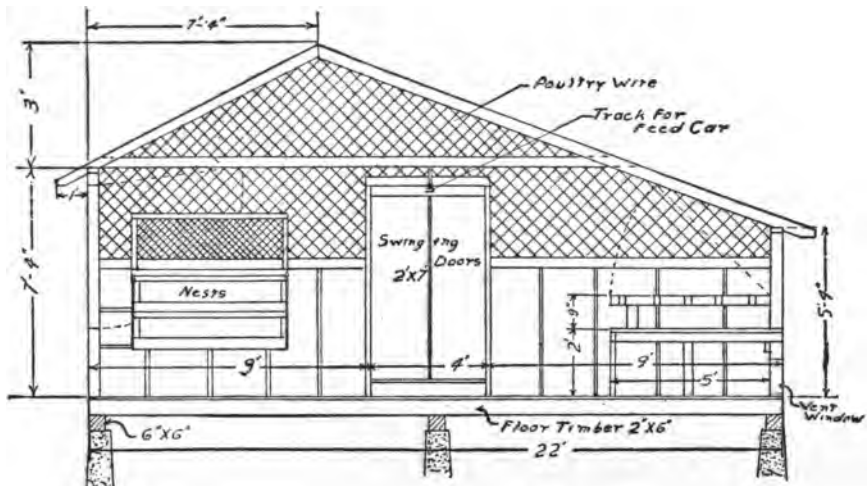
Cost. Since the profits that are made from the poultry business depend in part on the amount of so-called overhead charge, which includes interest on the money, taxes, and depreciation, it is obvious that the cost of construction of a henhouse should be seriously considered. It is not necessary that any henhouse be double boarded, or sheathed, or plastered, or in any other way made unusually warm. It is only necessary that a henhouse be absolutely tight on three sides. A henhouse should be as simply and plainly constructed as possible. The only

finish that is necessary on the building is that which will make it conform as closely as necessary to the other farm buildings.

Ease of Disinfection. The henhouse should be so constructed that there shall be few crevices to collect dirt. This can be accomplished by using drop siding or shiplap which is tongued and grooved and fits together snugly. This gives the appearance of clapboards and at the same time makes the house tight. The nests should be so constructed that they can easily be taken down, washed, sprayed, and dried.

Convenience. The henhouse should be so designed that the operator can stand up in it anywhere and do the work conveniently. If it is designed as a series of connected compartments under one roof it should be so constructed that a litter carrier can be used. This litter carrier will be a labor saver not only in removing the droppings, but in carrying grain, mash, water, green feed, or eggs.

Types of Henhouses. There are in general use several different types of henhouses having various shapes, styles of roof, open fronts, etc. The type which will give



DETAIL CONSTRUCTION OF LAYING HOUSE

the best results in a climate that is cold and frosty in winter will of course give good results in a climate where there is but little frost in winter. But a house that would give good results where there was but little frost would not necessarily offer the same advantage in a colder country.

Design of House Recommended. The house which is here recommended is designed as a series of pens, all under one roof and within connected walls. It is constructed with a two-thirds span roof; or, in other words, the peak of the roof is one-third of the way from the front wall, the front rafters being half as long as the rear rafters.

Each pen of this house should be twenty-two feet square. Such a pen or compartment will accommodate one hundred and sixty laying hens of the heavier breeds, such as Reds, Rocks, or Wyandottes. It will accommodate at least one hundred and eighty Leghorns or similar lighter birds. This type of house is economical to build; it is light; it gives the birds plenty of fresh air and exercise; and it allows a man to take care of a large number of hens with a minimum

amount of effort. It has been used successfully as far north as the northern part of New England. There is no apparent reason why it should not be successful farther north. It will be equally satisfactory in a warmer climate.

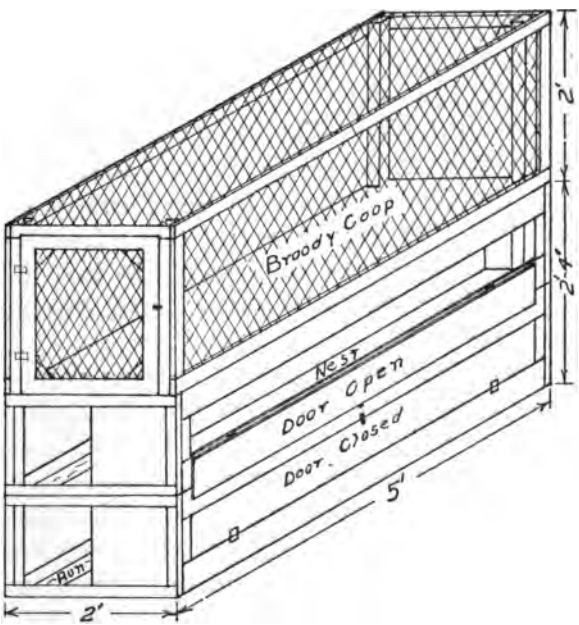
Height Aboveground. Any henhouse having a board floor should be placed at least a foot and a half above the ground. If it is so built it will be practically rat-proof, because rats will not live under a floor which is built up that high above the ground, since cats and dogs can easily get under the floor and drive them out. A floor so built will be more nearly dry because there is a free circulation of air under the floor. The house should not be banked up in winter, because if this is done the ground underneath the building will not freeze, and as capillary action pumps up moisture all winter the floor will always be moist.

Foundations and Floor. The best foundations are cement piers, although posts of cedar or chestnut may be used. The floor is best made of single, matched spruce or pine flooring. With plenty of litter on the floor it will be sufficiently warm.

Dirt Floors Not Economical. Dirt floors should never be used in a henhouse because they are hard to keep clean. The only time that a dirt floor is really fit for a hen to live on is during a month or two after the floor has been laid or after it has been cleaned out and new dirt put in. After two months the dirt becomes thoroughly mixed with the droppings. In the long run a dirt floor is expensive to maintain, because it is absolutely necessary that this floor be entirely removed at least once a year and new dirt or gravel hauled to the henhouse, shoveled into the building, and then evenly spread. This, in a commercial poultry plant, or in any poultry plant, for that matter, involves a great deal of work.

Cement Floors. A cement floor can be fairly satisfactory. In localities where gravel is handy it is a comparatively cheap floor to construct. But, unless it is very well built, it is likely to be damp, owing to the capillary action causing moisture to pass up through the foundation and into the cement. It is a cold floor under any conditions, and is no easier to keep clean than a board floor.

Nests. The nests should be built on either side of the pen and toward the front of the building. They should be built in



CONSTRUCTION OF NESTS AND BROODY COOP

tiers, one above the other, and the upper and lower tiers should be separate from each

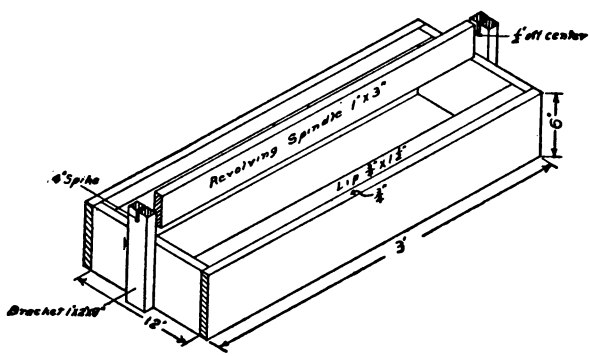
other so that they can be more easily taken out and cleaned. Each nest should be one long, continuous compartment with no partitions. The hens are less likely to break eggs in such a nest than in one which is partitioned. A drawing of this nest will be found on page 63.

Broody Coop. The broody coop should be built above one of the tiers of nests. The floor should be made of matched boards so laid that they can be easily cleaned. The walls and top of the coop should be built of wire. There should be a door which can be easily opened.

Feed Hoppers. The feed hoppers should be so constructed that the mash is always available and yet so designed that the hens cannot waste the mash or scratch litter into it. Many types of deep self-feeding hoppers are in use. But in deep hoppers, whenever there is an excessive amount of moisture in the air the mash is very likely to become moist, stick to the side of the hopper, and not flow readily.

The hopper which is recommended is shown on page 65. This hopper is usually

placed on pieces of two-by-four set up edgeways and is located directly under the open front and about a foot away from the front wall. With the hopper located here practically no litter is ever scratched into it.



CONSTRUCTION OF FEED HOPPER

It is easy of access and the birds can see to get to it, even late at night.

There is no necessity for placing a mash hopper on an elevated platform in order to provide exercise for the birds. They will get sufficient exercise during the day in searching for scratch grain. The mash

should be made so readily accessible that the birds will not be obliged to make any extra effort to obtain it.

While the hopper shown requires a little more frequent attention than do some of the deeper hoppers, this fact is indirectly an advantage, because the poultryman should keep an accurate record of the amount and pounds of mash and scratch feed his birds consume each week, and this record is more easily obtained in using a small hopper than in using large hoppers which may furnish a month's supply of mash.

Water Containers. The water containers should be such as can be easily cleaned, should be inexpensive, and, like the mash hopper, should be easily accessible.

The best water container to use for summer or winter is an ordinary twelve- or fourteen-quart galvanized-iron pail. In the summer it is set on the floor inside of a frame which prevents the birds from tipping the pail over, and which furnishes them with a platform upon which they can stand. In winter, if in a climate where freezing occurs, this same pail is set into a small box lined with

asbestos paper, having an opening at the top corresponding to the diameter of the pail about five inches below its top. In the bottom of this box is placed any one of several commercial lamps made for the purpose of keeping the water from freezing. It will be necessary to bore several holes in the sides of the box, two or three inches above the floor.

This water container, both summer and winter, is placed near the front of the building under the open front, principally to locate it in a place where the least litter from the floor will be scratched into it, since usually the birds face the light and scratch backward.

Dropping Boards. The dropping boards should be laid perpendicular to the back wall, because if they are laid parallel to the back wall the operator will have difficulty in cleaning them off readily. They should be matched boards, so as to leave no large crevices.

Roosts. The roosts, in a twenty-two-foot house, should be in three sections, hinged at the back so they may be tipped up out of the way when the dropping boards are cleaned.

Partitions. If two or more compartments or pens are to be built, the best partition is one made of boards running the width of the building and up to a height of a foot above the roosts. The remainder of the partition should be of inch-mesh wire.

This gives good circulation of air, especially in the upper part of the henhouse toward the back part. Also, it gives more sunlight in all of the pens because, as the sun is setting toward the west, it will shine diagonally through the open spaces of the partitions, and in the same manner the morning sun will shine diagonally.

While this particular type of henhouse is not the only good house that has been built in this country, it is a house that will give satisfaction anywhere and it provides all the requirements of a good house.

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CHAPTER VI. FEEDING PULLETS

The Dual Purpose. In the feeding of pullets throughout their first laying year the poultryman is concerned in securing the maximum number of eggs that can be produced per hen consistent with good hatchability of the eggs. Therefore, the feeding

problem is a dual one of producing all the eggs possible, but at the same time maintaining the vigor and condition of the pullets at such a pitch that in the spring months the eggs which they lay will produce a large percentage of chicks that will live and grow.

Condition of Pullets. The pullet, when she is about to lay or has just begun to lay, is invariably fat. This surplus of fat she accumulates to use as a reserve during cold weather, and this reserve of fat must be maintained as far as possible if we are going to keep the pullet in good physical condition.

Adjusting Feed to Egg-Laying. Poultrymen consider that the egg-producing ingredients of the feed are found largely in the mash, whereas the body-maintenance and fat-forming ingredients are found in the scratch feed.

It is possible for the feeder to regulate the consumption of mash by a flock of pullets because they will naturally eat scratch feed more readily than mash, since they like it better. Thus, the proportion between the two kinds of feed can be controlled in spite

of the fact that the mash is before them all the time.

On this basis the adjustment of the feed for pullets is a comparatively simple problem. If the quantity of scratch feed given to a flock of pullets is somewhat reduced they will, within certain limits, eat more mash in proportion. If they eat more mash they will be getting more of the egg-producing ingredients, and we shall find that a larger number of eggs will be laid. On the other hand, if the quantity of scratch grain feed is materially increased, the pullets will eat less mash and we shall find that egg production is lowered.

How to Judge Condition. There is a reliable and easy means by which the poultryman may know whether egg production is getting higher than is consistent with the condition of his birds. The test is the weight of the birds. Several pullets, say eight or ten out of each one hundred, should be banded and weighed and the individual weight of each pullet accurately recorded. Then the same pullets should be weighed at frequent intervals—every two or three weeks.

Of course, the birds should be weighed at the same time of day. It is immaterial what time is selected.

How the Weights Should Run. The pullets, for a short time after housing, should gain in weight. After that there should be no appreciable drop in weight throughout the whole winter season until after the incubation period is over. If there is a drop in weight the quantity of scratch feed should be increased. Presently, the natural sequence will follow—that is, the egg production will fall off and body weight will increase.

Standards of Egg Production. A reasonable standard of egg production will run as follows: Through September, 20 per cent; October, 30 per cent; November and December, 35 to 40 per cent; January, 40 to 45 per cent; then the production may be allowed to go to 50 or above during February, March, and April, without materially causing the birds to lose flesh and without at all impairing their production of vigorous hatchable eggs.

Amount of Scratch Feed Required. The amount of scratch feed that will be

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necessary to produce these results will vary, not only with the climate, but also with the type of hens kept.

The following table will give the reader a general idea of approximately the amounts required for Leghorns in the general latitude of the southern part of New York or northern part of New Jersey, and in areas westward with the same climatic conditions:

September	10	pounds	daily	per	100	hens
October	11	"	"	"	"	"
November	12	"	"	"	"	"
December	12	"	"	"	"	"
January	13	"	"	"	"	"
February	13	"	"	"	"	"
March	13	"	"	"	"	"
April	12	"	"	"	"	"
May	11	"	"	"	"	"
June	10	"	"	"	"	"
July	9	"	"	"	"	"
August	6	"	"	"	"	"

The following table will apply to Rhode Island Reds, Rocks, or Wyandottes under the same climatic conditions:

September	10	pounds	daily	per	100	hens
October	11	"	"	"	"	"
November	13	"	"	"	"	"
December	14	"	"	"	"	"
January	15	"	"	"	"	"
February	14	"	"	"	"	"
March	14	"	"	"	"	"
April	13	"	"	"	"	"
May	12	"	"	"	"	"
June	10	"	"	"	"	"
July	10	"	"	"	"	"
August	9	"	"	"	"	"

For the conditions which prevail in central or northern New England and in areas westward with the same climatic conditions the following figures will apply for Reds, Rocks, and Wyandottes:

September	12	pounds	daily	per	100	hens
October	14	"	"	"	"	"
November	16	"	"	"	"	"
December	17	"	"	"	"	"
January	20	"	"	"	"	"
February	20	"	"	"	"	"
March	18	"	"	"	"	"
April	16	"	"	"	"	"
May	15	"	"	"	"	"
June	12	"	"	"	"	"
July	12	"	"	"	"	"
August	10	"	"	"	"	"

For Leghorns and similar breeds under the conditions in central or northern New England and in areas westward with similar climate about one-fifth less scratch feed should be given than in the above table.

Ratio of Mash to Scratch. If an accurate record is kept of the total number of pounds of mash and scratch feed consumed, it will be found that the proportion of mash to scratch in the more northern areas will be approximately as follows: September and October, equal parts of each; November, December, January, February and March, two of scratch to one of mash; April and May, equal parts of scratch and mash; June, July, and August, two of mash to one of scratch feed.

Dry-mash Formula. The dry-mash formula which is recommended is as follows:

Corn meal or hominy feed	100 pounds
Bran	100 "
White middlings	100 "
Gluten feed	100 "
Meat scraps	100 "
Rolled oats	90 "

In this formula the amount of meat scraps should be reduced to fifty pounds if milk is fed. See paragraphs on feeding milk.

Scratch-feed Formula. The scratch-feed formula which is recommended is composed of equal parts by weight of cracked corn, whole oats, and whole wheat.

Increased Amounts in Winter. It will be noted from the above tables that considerably more scratch feed is given to the birds in winter. The reason for this is readily understood, since the scratch feed furnishes the body maintenance of fat and fuel. Naturally, more fat and fuel are used in cold weather than are used in warmer weather. Further, if, as winter comes on, the birds do not get an increased quantity of scratch feed, they will use up all the body reserve of fat by laying too many eggs in proportion to their capacity and their maintenance ration. Presently they will become thin, will shed their feathers, and will stop laying. This period of nonproduction will last from three weeks to three months. Whereas, if the body weight of the birds is maintained during cold weather by feeding an increased quan-

tity of scratch feed, the birds will shed but few feathers during the first winter, and will continue to lay all winter long.

Decreased Amounts in Summer. It is every poultryman's ambition to produce as many eggs in summer as possible, and in order to do this he must get the birds to eat as much mash as they will during the warmer months. To accomplish this the scratch-feed ration should be reduced, thus causing the birds to eat more mash.

If this plan is followed the birds are much less likely to become overfat and lazy. Because they have consumed more mash they will lay more eggs. The egg production will not drop to a low point in the summer as is frequently the case when too much scratch grain is given during the warmer months.

How to Feed Scratch. The scratch feed should be given in a deep litter to induce as much exercise as possible, because it is thoroughly proved that birds that are kept active, both summer and winter, show better appetites, eat more food of all kinds, and therefore have a greater power to produce

eggs because they are in better and more vigorous condition.

One-fourth of the day's supply should be fed in the morning, one-fourth at noon, and one-half at night. In excessively cold weather, for instance, if there are two or three days when the thermometer goes to considerably below zero, two or three pounds extra of the scratch feed per one hundred hens should be given each of these days. This may be given in extra feeds, so as to induce as much exercise as possible.

Green Feed. It is considered by many poultrymen that green feed in some form is essential. The green feeds which are most generally used are sprouted oats, cabbage, and mangels. Of the three, sprouted oats are best.

Sprouted Oats. If oats are sprouted for green feed the grain used for the purpose should be that which has not been treated with sulphur or by any other similar process. The sprouts should be allowed to grow not over two or three inches and should be fed in the litter so that the birds will have to search to get them.

In order to sprout oats two things are essential—heat and moisture. If the oats are kept around eighty-five to ninety degrees they will sprout quickly and will not mold, provided they are moistened once a day with comparatively warm water. Do not use hot water.

Cabbage and Mangels. Cabbage makes a very good green feed, the objection to it being that it will not keep all winter. Also, in the average house cellar and under the best of conditions, there is considerable work involved in stripping off the outer leaves which should not be fed to the hens. The principal advantage of mangels is their keeping quality.

Milk as a Substitute for Green Feed. There is one feed which is coming more and more into general use and which the author believes will take the place of green feed, and this is milk—sour skim milk or buttermilk.

Value of Milk. Milk is known to contain the vitamines which apparently have been proved to be essential to growth and to maintenance of life. Birds which are fed on

a ration which includes milk will keep in better physical condition. There will be fewer deaths from such a pen than from a pen fed no milk. If such birds go through a molt or partial molt they will feather much more readily and quickly. The eggs from milk-fed hens will hatch better and will produce better chicks. In the judgment of the author, if any strain of hens is fed for five consecutive generations, both as chicks and hens, on a diet containing milk, there will be an extraordinary gain in the general condition. In fact, the author believes that no man in the poultry business to-day should try to grow chickens or keep laying hens without the use of milk in some form.

Substitutes for Liquid Milk. Since many poultrymen live some distance from a creamery or even from a railroad station, it often is difficult to obtain liquid milk. However, there are on the market to-day several substitutes which can economically be used. Semi-solid buttermilk is a product which is comparatively low in price, will keep well under any conditions, and will be relished by the hens. If no liquid milk is available, this

product, as far as the author's experience has proved, is a satisfactory substitute.

The best way to feed it is just as it comes from the barrel. If several narrow wood strips, three or four inches wide, are nailed between the studs along the walls in the poultry house, about a foot from the floor, the semi-solid buttermilk can be spread thinly upon these strips. This gives all the hens an opportunity to get their share. At the same time, it is kept up, away from the floor, so that no dirt or litter can be scratched into it, and the fowls themselves cannot get up onto the strips to foul them.

Amount to Feed. The quantity to be fed to pullets is as follows: Two and one-half pounds per hundred hens, per day, during September, October, and November; three pounds during December and January; four or five pounds per hundred hens, per day, during the remainder of the year.

If semi-solid buttermilk in these quantities is furnished to the laying hens, the quantity of beef scraps in the mash ration should be changed from one hundred pounds to fifty pounds. If liquid milk is given instead of the

semi-solid buttermilk and the birds have access to all they wish, the same change in beef scraps should be made.

Dried Buttermilk. Dried buttermilk can be purchased almost anywhere and is being used to a great extent as a milk substitute. From the author's experience the birds do not eat it as readily as semi-solid buttermilk and, therefore, the latter is preferred, if it is the intention to get as much milk into the birds as possible.

Pot Cheese. A new product on the market known as pot cheese is also being used to a considerable extent. Just how long the product will keep in summer is not known to the author, but it seems probable that it will keep as long as the poultryman would normally have it on hand, because naturally he is going to buy only in such quantities as will be used up in a comparatively short time.

Care in Using Substitutes. In the case of any milk substitutes we must use discretion. The mash should not be overloaded with powdered milk, for instance, because the birds will not eat the mash if it is. In the case of semi-solid buttermilk, unless the

quantity used out of a barrel each day is sufficient to bring a fresh layer to the top, mold is likely to form on top of the barrel. The way to avoid this is to cover the top of the barrel with two or three inches of bran. The bran mixes with the buttermilk nicely and will keep the flies and air away from the milk.

Maintaining Appetite. Above all things in the feeding of pullets, be sure that they have just a trifle less feed than they really would eat. They ought always be glad to see the feeder. They should immediately go to scratching as soon as the scratch feed is given. They should have such a quantity of feed as will produce a reasonable number of eggs.

Keep the birds in good condition. See that the mash is always available. And see that a generous supply of fresh water is furnished, warm in the winter and cool in the summer.

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CHAPTER VII. SELECTION OF BREEDING STOCK

Breeding from Pullets. From all available egg records, from egg-laying contests, and from the records kept by the commercial poultrymen, it is considered that the hen in her first, or pullet, laying year will lay more eggs than in any succeeding year.

If a man were in the poultry business for eggs alone he would naturally keep pullets and nothing else. But if a man is going into the chicken business seriously, and expects to stay in it, he must plan to replace his stock. Therefore, he is obliged to use some

of his stock for breeding purposes. The question then arises whether he should use pullets as breeding stock.

Until recently it has been the consensus of opinion that a man should not use pullets as breeding stock under any consideration. This belief probably was due to the fact that formerly men hatched their chickens considerably later in the season than now (formerly, say, in the latter part of April, May, or in June). Such pullets probably did not reach maturity until the latter part of November or early in December. Under these conditions the birds would be altogether too immature to use the same season as breeding stock.

Pullets Satisfactory. To-day the modern commercial poultryman hatches chicks in February and March and has his pullets laying in July and August. Thus, conditions have changed. Under these modern circumstances the judgment of the author is that pullets may be and should be used as breeders.

This conclusion has been reached after several years of successful use of pullets as

breeding stock. Further, 90 per cent of the successful poultrymen in that section of the country where the author resides use nothing but pullets as breeders. They not only use no old hens at all, but they have carried on this system of breeding for from five to twelve years and are as uniformly successful to-day as they have been at any time in the past.

Vitality Maintained. There has been no apparent depreciation in the size, the vigor, the vitality, or the stamina of the present-day stock. When a poultryman can keep twelve hundred laying pullets and use the best five hundred of these as breeding stock, can produce eggs which will average to hatch 65 per cent of the total number of eggs incubated, and when the mortality of the resulting chickens for season after season of breeding will average not over 12 to 15 per cent and frequently as low as from 3 to 5 per cent, it is apparent that there has been no appreciable lowering of the vitality of the stock

Further, these chickens are being managed so that at four months the cockerels of such

breeds as the Reds weigh four and three-quarters to five pounds, while the pullets at the same age are ready to begin laying. The pullets reach maturity at five to five and one-half months. With this record it is evident that there is no loss in the value of these birds as producers of eggs. In other words, the bird managed under this system, instead of being lowered in vigor and value has been improved.

Evidence from Records. Experiment-station records show that more hens die in their second laying year out of a given flock than die as pullets out of a similar flock. In other words, taken as a whole, a flock of hens is not as strong and not as vigorous in their second laying year as they were when they were pullets.

Vigor of Pullets. A pullet which has laid for five or six months previous to the time that her eggs are saved for incubation is in the prime of her life. She has not begun to go downhill in vigor or vitality; her digestive system has not been impaired by the forced feeding which our poultrymen at the present time are using from the time the

pullets are three weeks old until they are dead. A flock of one hundred of these pullets will produce more eggs per day during the time of saving the eggs for hatching—from the 1st of February until the 10th or 15th of April, than the average flock of one hundred hens in their second laying year. These eggs have been proved to be fully as fertile as, and in many cases more fertile than, the eggs produced by the old hens.

Lower Cost of Chicks. Under these conditions it is obvious that the pullets will produce chickens more cheaply than the hens will. From the author's experience, and from the figures secured on the hatchability of the eggs and vitality of the chicks, it is certain that the stock raised from mature pullets will be at least as good as the average chickens from old hens.

Maturity of Pullets. Where pullets have laid for five or six months previous to the time their eggs are saved, there should be no question as to the maturity of the stock. Under the old poultryman's conditions or the present farm conditions there are, we should judge, but few hens which lay as many eggs

in the first two years of their life as these pullets lay in the first five or six months of production.

Necessity of Maintaining Weight. The one important circumstance that will cause the eggs from pullets to hatch poorly is the following: If the pullet has laid very heavily during the five or six months, has been fed insufficient scratch feed for her to maintain her normal weight, and has begun to lose weight, then she has begun to go to pieces physically and cannot put the ingredients into the eggs which are necessary to produce strong, livable chicks.

Summary. The present-day poultryman should use pullets as breeders, feed them heavily during November, December, January, and February on scratch feed, possibly slowing up their production a trifle, but endeavoring to maintain the health and vitality of the stock, the best measure of which is the weight of the birds.

Male Birds. In breeding to these pullets the poultryman should use cockerels hatched at the same time as the pullets. The reasons are practically the same as those which make

it advisable to use pullets rather than old hens as female breeders.

Saving in Money. The question of cost enters into the case with males as well as females. If we use two-year-old cocks for breeding we must keep over into the second year one male bird for every ten or twelve females, because some of the males are almost certain to die and because some of them are likely to be injured by fighting. At present prices of feed it costs approximately two dollars to feed a male bird one year. This two dollars must be charged against the ten or twelve hens to which he may be mated. In other words, it has cost us at least sixteen cents and possibly twenty cents per hen to carry over the male bird from the time that he might have been used as a cockerel breeder to the time when he is used as a cock breeder, or into his second year of age. This is equivalent to subtracting sixteen to twenty cents from the profits that we can make from a hen. With a thousand hens this runs into money.

Advantage of Cockerels. A strong, vigorous male bird which is ten to eleven

months old when he is mated will serve more hens than a two-year-old male, and the eggs which are produced by the hens mated to the cockerel will be more hatchable. Such a cockerel, like the above-mentioned pullet, is in the prime of life.

Characteristics. The best index of the vitality and vigor of male birds, especially at maturity, is comparable to that of pullets. The male bird should have a short, stubby beak, his legs should stand squarely under him; or, in other words, he should be neither knock-kneed nor bow-legged; the veins running up and down the outside of the leg should be dark red and very plain. If he possesses the power to transmit egg production he will have a long, straight breastbone, with a span of at least two fingers in width. His back will be broad and wedge-shaped from the wings to the hips. He will be a frequent crower and a fighter.

When to Select Males. The male birds should be selected at the time that they weigh two to two and one-half pounds, or just previous to the time when the surplus males are sold as broilers. At this time it is

easier to pick out a good male than when they reach adult size, because the difference between a rapidly growing male which now weighs two and one-quarter pounds and a slower growing male which weighs only one and three-quarters to two pounds is easily noticed. We have a better measure of the maturity of the birds at this time because, if the comb and wattles of any particular male bird have developed much more than the average of his brothers, it shows that he possesses the factor of early maturity. It is known, further, that the factor of early maturity is transmitted from the male bird to his offspring. In short, if we pick out from our male birds as breeders the earliest maturing, the quickest growing, the strongest and most vigorous, we will have the best breeding stock it is possible for us to select.

Select Double the Number Needed. At the time of selection, twice as many male birds as will be required for breeding should be chosen. This gives the poultryman an opportunity to eliminate later any birds that do not keep up with their brothers. Even among the so-called best birds there

will be some which will not do well. But if twice as many as will be necessary have been selected, the poultryman will have an opportunity to cull the birds during the remainder of the summer. This has proved to be a practical method in the selection of male birds and should show a gradual improvement of the egg production of the female offspring of such selected males, especially after two or three years of this practice.

Time to Make First Selection of Females. The best opportunity for making the first selection of female breeding stock is at housing time, because at this time the poultryman has an opportunity to pick out the earliest maturing females. If the earliest maturing females are selected he will have in his preliminary flock those birds which will develop into the best layers. The poultryman should go into each brood, regardless of the difference in age, pick out the best 25 per cent, and put these into the permanent laying house to be used as stock from which to select breeders.

Judging Pullets. The span of pullets which are about to lay will not be as great

as the span of those pullets which have laid for some time, but the difference in span between a good producing pullet and a poor producing pullet will be as marked or nearly as marked previous to the time of her laying as at any future time. By "span" is meant the distance between the back end of the breastbone and the pelvic or lay bones. See illustration showing method of spanning.

In selecting pullets for the breeding pen no pullet should be considered which will not span at least the width of two or three fingers.

Culling. From time to time these pullets should be culled, just the same as the poultryman will cull the rest of his stock during the winter. The characteristics which he will have in mind will be given in the chapter on Culling.

Final Selection. After pullets have laid from early July or August until the middle or latter part of January the poultryman will have an opportunity in January to go into his flock of birds which he has set aside as breeders and make a final elimination of the poorer layers. The birds which he has

left at that time—especially if he has had some experience in culling and has been discarding poor layers from time to time—will be the best fourth or fifth of the original number of pullets set aside in September.

Conclusion. In conclusion, the poultryman should use pullets as breeders. Pullets should have laid five or six months previous to the time they are finally selected as breeders. They should be those which have been quick to mature, and which at maturity had attained a good size, say four and three-quarters to five pounds for Reds and Wyandottes, five to five and one-quarter for Rocks, and three and three-quarters to four and one-quarter for Leghorns. This system of selecting breeding stock may be used continuously for an indefinite number of generations without any danger of depleting vitality.

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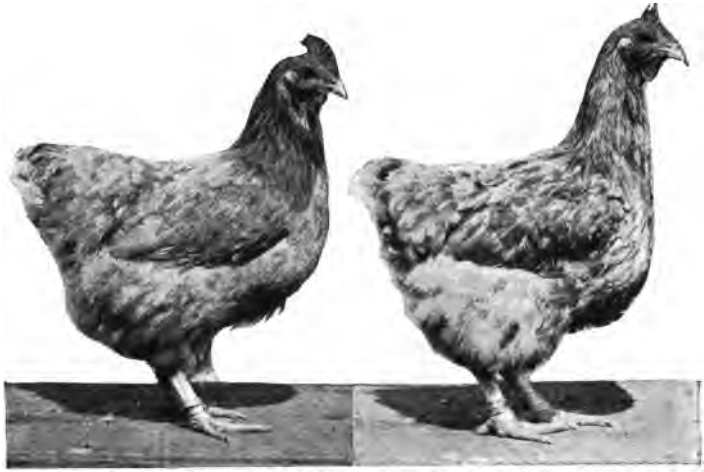
CHAPTER VIII. CULLING

Reasons for Culling. The average production of a flock of fairly good pullets is one hundred and twenty eggs per hen, per year. In any such flock we may safely assume that 25 per cent of these birds will lay approximately one hundred and eighty eggs, or 50 per cent more than the average; that 50 per cent of the birds will lay around the average, or from one hundred and ten to one hundred and thirty; and 25 per cent will lay sixty eggs, or 50 per cent less than the average. With such conditions prevailing it is plain to see that culling in order to eliminate poor producers is absolutely necessary.



THE HEN AT LEFT IS LAYING WELL. THE HEN AT RIGHT HAS MOLTED AND HAS STOPPED LAYING

TESTING "SPAN" BETWEEN REAR END OF KEEL AND PELVIC BONES. A SPREAD OF FOUR FINGERS INDICATES A GOOD PRODUCER. THIS IS CALLED "SPANNING"

TESTING SPREAD BETWEEN PELVIC BONES. A LAYING HEN WILL SHOW A SPAN OF THREE FINGERS AND THE BONES WILL BE FLEXIBLE AND THIN. IF THICK THEY INDICATE A POOR PRODUCER

These twenty-five birds out of each one hundred that are laying only sixty eggs per year are not any more than paying their own board. On the other hand, the remaining seventy-five are yielding a substantial profit. Therefore, the successful poultryman will make every effort possible to cull his hens and remove the poor producers from his flock. This, of course, applies not only to the removal of poor producers from a flock of breeders, but also their removal from the general flock.

When to Cull. The culling of any flock of hens should begin at the time that they are small chicks. If a man discards all of the poor chicks the day he takes them from the incubator to the brooder, he will have more money at the end of the year than he would have if he allowed them to remain in the brooder, to develop, and to reach the laying age. With poor chicks development is always slow. Invariably such chicks, if not discarded then, will prove to be the ones that a good poultryman removes from his flock and sells as culls at the time that he houses his pullets.

Culling should continue all summer, and those chicks should be removed which are slow to feather or which do not keep up with the average of the flock in growth and development.

From the remaining pullets left at housing time, the good operator should house approximately 90 to 95 per cent. The remaining 5 or 10 per cent, even in a good flock, should be sold as culls.

Culling in January. If the average commercial poultryman, running a one-man plant, has one thousand or twelve hundred pullets which go into quarters by the middle of September, he should do some culling in January, because, if there are pullets which have not begun to lay by January, they should be culled out.

As a general thing the price of live poultry is considerably higher in January than in June, July, or August. Assuming that the difference in price is five cents per pound, and the birds average five pounds apiece, there is a loss in value of twenty-five cents per bird in the case of any birds kept over until summer. If a pullet has not laid any

eggs at all up to January, and if the flock has been properly handled so that egg production is at a good level, then it is certain that this pullet is inherently a poor layer; and if she is a poor layer she would naturally be culled in June or July. If she is a poor layer it is apparent that she will not pay her own board, plus the twenty-five cents loss in value as live poultry. Therefore, it is best that she be disposed of in January.

Further Culling. Birds which have started to go to pieces between January and June should be disposed of. Birds which become out of condition or for any reason cease to lay should be culled. Beginning in June, systematic culling should be carried on throughout the whole flock, to dispose of all that have stopped laying.

How to Cull. In all culling the first emphasis should be placed upon the general health or condition of the bird. But there are several other important guides to follow.

Pigmentation. A valuable fact to consider is the pigmentation of the skin. In such birds as Reds, Rocks, Leghorns, and Wyandottes there is present in various parts

of the body at the time of maturity a certain amount of yellow coloring matter. This coloring matter is a thin layer of fat which is used up by the hen in the manufacture of the egg. The more rapidly eggs are produced and the greater the number, the more will this coloring matter disappear. It disappears first at the vent, after a week or ten days' production. Next, after the pullets have laid four or five weeks, it disappears on the beak, beginning at the end and gradually extending toward the point of the beak. After five or six months of production the coloring matter leaves the legs, first on the front and then on the back of the legs.

It follows from this that any pullet which in June, July, or August still has golden-colored legs has been a poor producer. We know that if she has been a poor producer she will continue to be the same. She should be culled out and sold.

Shape of Body. Another factor to be considered is the body conformation. This can be judged as follows:

If we put our thumb and finger behind the wings and move them toward the hips the

body should very clearly have a wedge shape. When we reach the hips, or just back of them, if we find that the body continues at maximum width for a distance of an inch and a half or two inches, we have an index of a good laying hen; whereas, if we find that the bird's body slopes rapidly or narrows rapidly toward the tail, we may be certain that she is not a good producer.

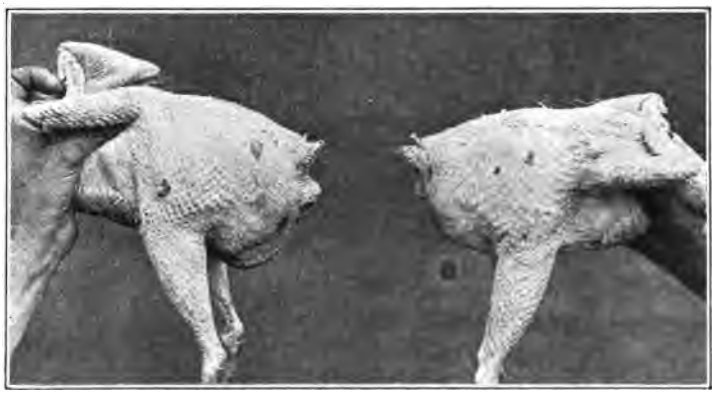
Span. The distance between the back end of the breastbone and the pelvic or lay bones should be at least four and possibly five fingers wide. This indicates capacity within the body of the hen for the development of the yolks. It indicates, further, a capacity great enough to assimilate large quantities of food.

Lay Bones. The lay bones or pelvic bones in a good-producing hen will be wide apart, flexible, and thin. If they are thick they will indicate a poor-producing hen, because such a condition shows that flesh or fat has been deposited over the edges or ends and that the bird is of a meat type and not a good egg producer. The width between the pelvic bones is, in itself, no indication of the total

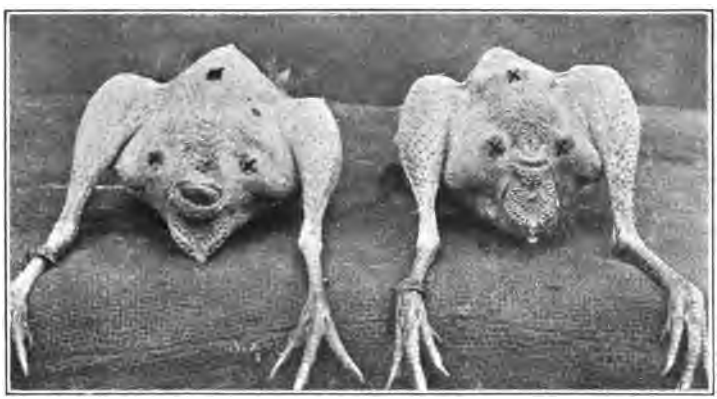
number of eggs that a hen has laid, because it has been found that the width between the pelvic bones may vary from day to day.

Shape of Shanks. Another factor to be considered in culling is the shape of the shanks. It has been proved that a bird with a round shank is apt to be a poor layer; or, in other words, she is a meat hen. But if a hen has flat or wedge-shaped shanks this indicates that she will be a good producer. Therefore, in the culling, the birds having round shanks should be sold.

The Head. The beak of a good-producing hen will be short and stubby, and will be faded, while the beak of a poor-producing hen may be yellow or may, very likely, be long and somewhat hooking. The eye of a good producer will be bright and not too prominent. If we hold the head in such a way that we look square at it, the eyes will not appear to be crossed. If a hen appears to be cross-eyed it will indicate that the bird has been a rather poor layer. The width of the head shows constitution; that is, the hen with a wide head is a strong, vigorous, thrifty hen, while the hen which has a



AT LEFT, FULL ABDOMEN INDICATES LAYING CONDITION. AT RIGHT, CONTRACTED, HARD ABDOMEN INDICATES THAT THE HEN IS NOT LAYING



AT LEFT, WIDE SPREAD BETWEEN KEEL AND PELVIC BONES AND BETWEEN PELVIC BONES THEMSELVES INDICATES LAYING CONDITION. AT RIGHT, NARROW SPREAD INDICATES NONLAYING. THE LOWER CROSSES MARK PELVIC BONES AND THE UPPER MARKS END OF KEEL. NOTICE ALSO MOIST, LARGE VENT AT LEFT, AND SMALL, DRY VENT AT RIGHT

rather narrow head will be low in vitality and naturally a poor layer.

Consider All Factors. In culling hens, one should not consider any one of these factors alone, but all of these should be taken into consideration. For example, suppose that a hen has a body conformation which indicates that she is a good layer but we find that her bill and vent are yellow. On first glance we might discard her, on the evidence of the yellow beak or vent. On the other hand, the facts of the case may be that the hen had just gone through her first and possibly her only broody period, had stopped laying two or three weeks, was about to begin to lay again, and would continue to be a good layer. Therefore, one must consider all of the characteristics and weigh them all before a bird is culled and sold.

Culling by Broodiness. The tendency of a hen to become broody may be utilized in culling. A colored, celluloid band, which can be easily taken off and put on, may be placed upon the leg of a hen every time she becomes broody, and will facilitate the culling

of poor layers. It has been proved that those hens which are frequently broody are poor producers. If, after a month or six weeks, it is found that certain hens have three or four leg bands showing that they have been broody three or four times in that period, or even if a bird has been broody as frequently as four or five times in eight or ten weeks, it proves that she is a poor layer and she should be culled and sold.

If a man picks up his broody hens every night, places them in a broody coop, and once each week goes over these broody hens, handles them over and throws out those birds which show from previous indications that they have been poor layers, he will gradually eliminate all the poor producers from his flock.

Breeding from Flock Culled in This Way. If such a culling campaign has been carried on thoroughly, at the end of the first laying year the birds that remain, possibly two hundred out of the original thousand, will naturally be the best two hundred hens. If the poultryman desires to use hens in their second laying year as breeding stock these

hens should make good breeders. In the first place, they have shown that they are good layers; otherwise, they would not be left at the end of the culling season. Further, if they have stood up, as far as health and vitality are concerned, they will make good breeders, because a hen that can stand up under heavy production, under our modern system of forced feeding, has in her make-up the faculties that she will need as a good breeder. This may appear to contradict the statement previously made regarding the use of pullets as breeding stock, but it is merely written to indicate to the man who does wish to use old hens as breeding stock what type of hens he should use.

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CHAPTER IX. MANAGEMENT

Preparing for New Pullets. Assuming that a man's commercial plant has a capacity of one thousand hens and that he is replacing each year the entire stock with new

pullets, the problem of cleaning the houses and getting ready for the new pullets arises. If he has culled his birds systematically and thoroughly there would probably not be over four to five hundred hens on the place by August 1st, which would mean that a little more than half of the pens would be empty. If such is the case the cleaning process is simplified.

Thorough Cleaning. Whenever the doubling up of various pens has left one or more empty that pen should be cleaned. All of the litter, droppings, and nesting material should be swept out. Then, if possible, a hose should be attached and the entire room or pen thoroughly washed. If the water is allowed to stand on the floor, the droppings which have stuck to the floor will be softened and may easily be removed. The house should then be allowed to dry, and after it is thoroughly dried should be sprayed with a strong solution of crude carbolic acid or any good similar spray. This again should be allowed to dry for two or three days and the house should again be thoroughly sprayed. The feed hoppers and nests also should be thoroughly cleaned, sprayed twice,

and, if possible, should be allowed to dry in the sun.

Teaching Pullets to Seek Grain. After the house and all of its equipment have become dry the litter for the new pullets may be placed in the house. For this a thin layer of shavings is recommended, perhaps a bale or a bale and a half to each pen twenty-two feet square. If this litter is put in thinly the new pullets, which have not been accustomed to scratching while on the range, will see the scratch feed among the litter and will readily learn to scratch. The change from the outdoor system of feeding to the indoor system will be made gradually. If a deep litter is used the pullets, not being accustomed to scratching, will not know enough to find the grain. In this case, at the end of a week or ten days considerable grain will be accumulated in the litter and, unless care is taken, the pullets may lose their appetite for scratch grain. If this happens they will also lose their appetite for mash, and the first thing the poultryman knows his production will start downward and the birds will begin to lose weight.

Changing Litter. After the birds have been housed two or three weeks additional litter, such as shavings with a layer of straw or cheap, coarse hay, should be used. This deep litter should be maintained throughout the winter. Whenever the litter becomes somewhat dirty from droppings, or if it becomes damp, it should be cleaned out. This, under average conditions, should be every five or six weeks. At this cleaning time all of the litter should be removed, the house swept out, and new shavings and straw put in. This may be done at any time during the day, if care is taken not to disturb or frighten the hens.

No Yards Necessary. In the system of management which is followed by the author no yards for the laying hens are used. While this is contrary to general practice, it has worked out nicely.

The feeding of the hens or pullets under this system is more nearly under the control of the feeder. For example, if in the early spring the birds have access to a yard in which there is plenty of green feed growing and if there comes a spell of cold, raw, rainy

weather, which may last several days, the birds will go outdoors very little and will be getting an entirely different kind of feed. Under such conditions it is difficult to determine the amount and kind of feed to give. But if the birds are kept confined the feed is entirely under the control of the poultryman.

It is often stated that the birds which are to produce hatching eggs should be allowed range. But if pullets are to be used as breeders and the poultryman intends to have all his chicks hatched out by the first or second week in April, it will be necessary that the last eggs shall be in the incubator by the last week of March. It is, of course, obvious that in the more northern sections of the country, where the climate is similar to that of New England, it is practically impossible to allow hens to go outdoors previous to that time.

Advantage of No-yard System. This system of no-yard management has been used by some of the most successful poultrymen of New England for a period of ten years and no harmful effects have been noticed.

It materially lessens the labor in caring for the hens, because with any system of yards the yards themselves require more or less attention. The ground, of course, requires special care, such as liming or cultivation, or both. The no-yard system also does away with the cost of a fence, together with its maintenance.

Treatment for Lice. At the time the pullets are transferred from the range to their winter quarters they should each have an application of mercuric ointment to control lice. The formula which is recommended is one part of mercuric ointment (or, as it is frequently known, blue butter) mixed with four parts of lard compound or any similar cheap grease. A piece of this mixture the size of a kernel of corn is rubbed well over the skin around the vent. No further applications will be needed until the following spring. The second application should be put on in the latter part of April, the third early in June, and the fourth and last early in July. If the birds are treated in this manner when they are housed and the house itself has been thoroughly cleaned and

sprayed, the four applications should keep the hens practically free from lice.

Treatment for Mites. Under many circumstances mites are a terrible pest and a menace to good egg production. They can be controlled by proper spraying. Mites live on the body of the hens only at night or possibly when they are on the nest. Therefore, it is an easy matter to rid a henhouse of mites. The henhouse, especially the dropping boards and the nests, should be thoroughly sprayed with a strong solution of crude carbolic acid or similar spray. A second spray should be put on about five days after the first application. If too long or too short a time elapses between the first and second spraying the treatment will not be successful, because the eggs which had already been laid at the time of the first spraying will not be controlled by that spray and will hatch. The second spray, if applied at the end of five days, will catch these young mites after they are all hatched and before they have become mature enough to lay eggs.

Salts. It has been proved that the use of Epsom salts is beneficial in maintaining the

physical condition of a flock of laying hens, if no milk or similar food is fed. The salts should be given once every three or four weeks, as follows: The dose is three-quarters of a pound of Epsom salts to each hundred birds. No water should be given the forenoon of the day when the salts are to be given. At noon, or thereabouts, the salts should be dissolved in about three-quarters of the amount of water that is usually consumed in a day by a given number of hens. At that time all of the hens are thirsty and will drink the water containing the salts readily. The dose of salts will be practically uniformly divided among all the hens. After the water containing the salts has been consumed, a pail or container of fresh water should be supplied them.

If milk in some form is fed to the hens, the only time the salts need be used is whenever the droppings become dry and hard. It is claimed that by the judicious use of salts the poultryman will not be obliged to use green feed in any form. While the author believes that from the mechanical standpoint of digestion salts will take the place of green feed,

yet he does not believe that salts will take the place of green feed for all purposes. In most of the green feeds which are used there are vitamines present, and naturally salts will not take the place of these vitamines.

Sulphur. Sulphur should be fed to laying pullets throughout the winter as regularly as once in four to six weeks. It is fed at the rate of one pound of sulphur to each twenty pounds of mash. This mixture of mash and sulphur is kept before the hens five or six days. The dose is repeated, as above mentioned, in four to six weeks. It merely aids the birds to keep in good physical condition.

Care of Droppings. The dropping boards in every henhouse should be cleaned off daily, summer and winter, but especially in the summer. It is good practice to scatter over the dropping boards, several times a week, a light coating of acid phosphate. This acid phosphate will preserve the nitrogen which is present in the droppings, and the combination makes a more nearly complete fertilizer. Also, the acid phosphate has a tendency to reduce the possible number of mites and keeps the henhouse itself con-

siderably cleaner. The droppings should be stored in a dry place and every effort made to keep them perfectly dry. If the droppings start to decompose and there is a strong odor given off, then they should be gotten onto the land and mixed with the soil as soon as possible.

Use of Droppings. The best way for the average poultryman to utilize the droppings is to scatter them on the land which he intends to plow up and reseed each season. This plowing-up and reseeding process should be carried on over one-third of the land used every year as range for young chickens, thus insuring a good sod in succeeding years and keeping the land sweet and clean.

Oats as Nurse Crop. When this reseeding is done it will be well to sow oats as a nurse crop or cover crop. The oats will furnish the poultryman with all the litter that he will need during the ensuing winter. The oats may be cut when ripe, stored in the barn and used as litter without having been threshed, because the hens will do just as good a job at threshing as any threshing machine and will do it much cheaper. There

is always, of course, the likelihood that mice will get into the oats while in storage in the barn; but this loss will be more than offset by the fact that straw that has not been run through a threshing machine will last longer on the floor of the henhouse and give better service.

Value of Artificial Light. The use of artificial light in commercial poultry plants is coming into more and more general favor each year. The author, without any reservation, heartily indorses the practice, provided, of course, that the lights are used with discretion.

Electricity Best. The source of light that gives the best service and causes the least difficulty is electricity, although kerosene lanterns are used quite successfully in poultry plants that do not have electric current available. Many poultrymen who have no access to electric current have installed electric-lighting plants of their own and consider that the added profit from the hens secured by the use of artificial light has warranted them in the expenditure. Usually all of the cost of such installation is not

charged to the hens, because the current will naturally be used in the house and in the barn.

There are on the market to-day several compact electric-lighting plants which are run by a gasoline engine and which not only furnish the electric current for lighting, but also pump the water which is required for the hens and in the dwelling.

Equipment. When electric lights are used, forty- to sixty-watt nitrogen lamps should be suspended about six feet from the floor, using over each lamp a shade fifteen or sixteen inches in diameter and four or five inches deep. For each pen twenty-two feet square two such lights should be used, suspended about equal distances between the edge of the dropping boards and the front of the building.

An ordinary alarm clock can be used as a means of throwing the electric switch. Attach a spool to the key that winds the alarm. Wrap a wire around this spool, the other end of this wire being attached to a plain knife switch. When the alarm goes off the key naturally turns, winds up the wire, and throws

the switch. It is an arrangement which any man can attach, and it is cheap.

Not All Birds to Be Lighted. Not all hens, under all conditions, and of all ages, should necessarily be lighted. It has been found by experience that it is poor economy to try to light a flock of hens in their second laying year until they have completely molted, grown a new coat of feathers, and started in to increase their egg production. Then the lights may be used, at such time as to give a fourteen-hour day.

Lighting at Morning. If the lights are used in the morning only, practically all of the birds—good, bad, and indifferent—will get down from the roosts and go to scratching and eating. It has been found that the so-called "evening lunch"—that is, getting the birds up at eight o'clock at night and keeping them up until nine or half past—has given very good results; but it seems to the author that it makes a poultryman's day much longer and much more complicated than the morning-light system.

Lighting of Pullets. Early-hatched pullets, which are to be used as breeders and

which begin to lay in August, may be lighted approximately the 1st of November, just long enough to make up for the shorter days through December and January. In other words, they should have eleven or twelve hours of total light, natural and artificial. Artificial light is in no sense a stimulant, but merely increases the working hours of a hen, thus giving her an opportunity to eat more food. If she eats more food she will lay better and it will be easier to maintain her weight as well as her health and vigor.

For late-maturing pullets, not to be used as breeders, lighting may be started approximately the 1st of November and a fourteen-hour day utilized. Caution should be exercised to see that the later-maturing pullets are practically mature before the lighting begins. Under ordinary circumstances this should be by November 1st.

The one thing which is essential when using artificial light is to see to it that the birds have plenty of feed. The amounts of scratch grain which were suggested in a previous chapter should be increased by

approximately one-fifth if the birds are to be artificially lighted.

Keep Water from Freezing. Some plan should be followed whereby the water may be kept from freezing, because it is essential that the birds have access to water after they get up in the morning. The poultryman, of course, does not want to get up at three-thirty or four o'clock merely to water the hens. There are on the market several types of small stoves similar to an incubator lamp. These have given about as good satisfaction as anything. While they are not absolutely fireproof, there is very little danger following their use. These stoves should be placed in a box lined with asbestos paper. Several small holes should be bored in the box for the ventilation of the lamp. The water pail is set down in the box, and the top of the box so made that the pail fits tightly. All that is necessary is to keep the water from freezing. It is not essential to keep the water warm, though if it is kept warm it will be better.

Feed and Egg Records. There are certain records which every poultryman

should keep; namely, an account that will show him the total production of eggs, the total consumption of scratch feed and mash, and the mortality. A record sheet such as is here suggested gives all the information as far as feeds are concerned, gives the poultryman an opportunity to know at the end of each week just how many pounds of feed have been consumed, and discloses what the proportion of mash to scratch feed has been. After such records have been kept for a period of two to three years a poultryman can devise feeding formulas or proportions of mash and scratch which his own particular strain of hens needs under his own particular climatic conditions.

Incubator and Brooder Records. Incubator records should be kept which give the poultryman a knowledge as to the fertility of his eggs, the total number of dead in shell found in each hatch, and the total number of chicks hatched. Brooder records should also be kept which show the mortality of the chicks and the dates when they died. These should also furnish him information

as to the amount of feed required and the amount of coal consumed.

As with egg and feed records, the longer such records as those of incubation and brooding are kept the more valuable they become, because they may prove at the end of a year or two that a certain incubator should be discarded and a certain type of brooder stove should be abandoned.

Profit and Loss Records. Further records which show the total cost of the feed consumed, and the average price of eggs received, should be kept. By means of these the poultryman can tell at any time whether his hens are paying a profit and just how much. If they are showing a loss he will know it at once and take every measure to prevent it.

Care of Broody Hens. Everyone, regardless of the strain of hens, will have many hens that are broody during the spring. The method of breaking up these hens so that they will get back to laying as soon as possible is as follows:

All of the broody hens which are on the nest at seven or eight o'clock in the evening

of each day should be taken off the nests, placed in the broody coops, and then fed on the same kind of mash and the same quantity of scratch feed they would have received if they had remained on the floor of the henhouse. They, of course, should have access to water or milk—whichever is given as drink. The birds should be collected each night during the week. Then once a week, for instance Saturday morning, all of the birds should be allowed to come out of the broody coops and come down on the floor of the henhouse. Beginning again Saturday night, all those on the nests should be put back into the broody coop and kept there until the next Saturday morning.

By doing this the birds will be broken up in a short time; or, in other words, before they have the habit firmly established. If they are fed in the same way that they would have been if they were laying hens, they will be kept in good laying condition and will not have to adjust themselves to a change of feed and then readjust themselves to a second change of feed.

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CHAPTER X. MARKETING

Importance of Marketing. The profits which are to be made out of any poultry enterprise depend not only on the production of a large number of eggs, or on raising chicks that grow vigorously, but also on the success of the poultryman in marketing his product and obtaining the best possible prices.

Selling When Prices Are High. A poultryman should closely watch his markets and obtain from the nearest board of trade or chamber of commerce daily or weekly quotations not only of fowl, broilers, and eggs, but also of the grains which he may purchase. Every effort should be made to dispose of his product at the time of year when that particular product brings the highest price. He should plan always to hatch his chickens early, so that his broilers will reach the market during the time when broilers are high. All of the males which are not to be used as breeders should be disposed of when they weigh from two to two and a half pounds.

Feed Required for Males. It has been quite definitely proved that seven or eight pounds of feed is all that is required for the first two pounds of growth and that from twelve to twenty pounds of feed are required for each succeeding pound of growth up to six pounds. Therefore, it is obvious that the commercial poultryman cannot afford to keep his male birds until they weigh five or six pounds. If it requires eighteen to twenty pounds of feed to put on the fifth pound of

growth and the feed is costing two and one-half cents per pound, and if live roosters are selling for thirty cents a pound in the fall, the poultryman certainly has lost money on this particular fifth pound and, in addition, is deriving a lower price per pound on the entire weight than he could have got earlier in the season.

Attention to Pullets. If the surplus males are disposed of as broilers more room is left for the developing pullets. This also gives the poultryman more time for the care of the pullets, and pullets will repay the extra attention. They will make a better and more economical growth, and will reach maturity sooner. As has already been shown, the sooner they reach maturity the sooner they will begin to lay the high-priced eggs which are produced in November, December, and January.

Fattening. When hens are culled out they should be fattened before being sent to market. This fattening process should take approximately ten days, or, in any event, not longer than two weeks. The birds should be fed and handled as follows:

A mash made of equal parts of ground oats, corn meal, and middlings should be mixed with sour skim milk or buttermilk until it is moist and this wet mash should be given to the birds half an hour at a time, three times a day. At the end of half an hour the mash should be taken away. The birds should be confined in small quarters, such as a berry crate or a regular fattening crate, because the less exercise they take the more readily they will fatten. During the intervals between feeding the birds should, if possible, be kept in the dark. By so feeding and handling, the birds can be made to take on an appreciable quantity of fat.

Advantage of Fattening. This fattening produces an increased quantity of flesh at a price which is considerably less than the price per pound of live fowl. Incidentally, it gets the birds into better condition. They should sell more readily in the open market and under ordinary conditions should command a little higher price than the average fowl which has not been fattened.

Fattening Male Birds. The fattening process should also be used in the handling

of the male birds at the end of the breeding season. It is questionable, however, if it pays the average poultryman to attempt to fatten his broilers. Owing to the fact that the poultryman at that time of year is exceptionally busy, the best system to follow in disposing of broilers is to go into the various brooder houses and, after selecting the breeding males, to take out any remaining males that weigh two or two and one-half pounds, put them in crates, feed them well on scratch feed, and ship them to market.

Dressing. If the poultryman is situated where he has a good retail market which will pay him a fancy price for his dressed fowl, and if he has the time to do the work, it will pay him in dollars and cents to dress his own fowl.

Scalding *vs.* Dry Picking. There are two methods of killing and picking fowl in general use: (1) the scalding method; (2) the dry-picking method. For immediate consumption or for home use, and especially in the case of a man who does but little killing and is not expert, the scalding method is probably the better. But for birds which are

to be held some little time before being used, or for birds which are to be sold, the scalding method is not advised, because within thirty-six or forty-eight hours after the birds are scalded the flesh begins to turn brown and may eventually turn black. This, of course, spoils the appearance of the carcass and renders it less salable. Usually fowl dressed in this manner brings less per pound than fowl picked dry.

Starving Before Killing. In dry picking or in scalding it is essential that the birds be starved for twenty-four to thirty-six hours before being killed. This practically empties the digestive tract and if the digestive tract is empty the birds will then keep in good condition without being drawn. In fact, it has been proved that undrawn birds will keep better than drawn.

How to Kill for Dry Picking. In dry picking the one essential for success is proper killing. The bird should be hung up by a cord which has a button or small stick fastened at the lower end. The free end of the cord is wrapped once around the legs of the bird to be killed and the button or stick is

swung back over the cord, binding between it and the legs of the bird. This holds the bird, although no knot is made.

The knife to be used in killing should be sharp and have a thin, narrow point. The head of the bird is held firmly between the thumb and first finger, the knife run down the throat to a point just beyond the eye, and an incision made on the inner, lower side of the throat so that the blood flows freely. Then the knife is turned and the end of it is forced into the skull at a point just back of the eye, with the back of the knife pressing firmly against the lower bill and the lower bill pressed downward as far as possible. If the knife is so held the point will enter that part of the brain which controls the muscles of the skin and a relaxation of these muscles takes place which allows the feathers to be easily removed.

Use of Weighted Cup. Have a blood cup which has been weighted with lead at the bottom and has had a large, sharp hook soldered to the inside near the top. Fasten this in the beak immediately after sticking. It simplifies the picking process, because the

cup catches the blood and the weight of the cup prevents the bird from moving its head around. The picking should be done just as soon after the bird has been stuck as possible; the sooner the picking is done, the more readily are the feathers removed.

If the bird has been properly stuck the feathers can almost be wiped off, rather than being pulled off, and the bird presents when dressed a fine appearance. All of the feathers on the body and wings should be removed, leaving a few perhaps on the head.

Shipping Poultry. In summer, if the birds are to be shipped some distance, it is necessary that they be packed in a box which contains ice. But, of course, if the poultryman has a local market it is not necessary that the birds be packed. They should be cooled as quickly as possible. An ordinary household refrigerator will suffice for this if nothing else is available. Poultry should never be cooled in water, because the carcass does not look as well after it is dried out as it would if it had not been placed in water.

Washing Off Blood. If a fancy trade is to be catered to, it will be good policy to see

that the birds' feet are thoroughly washed after picking and also that any blood which may be in or on the head is removed. The better the appearance of the carcass, the more readily it will sell and the higher price it will bring.

Selling Eggs. The poultryman should make every effort to dispose of his eggs direct to the consumer, if that be possible, or at any rate, to a retailer. By so doing he will avoid sending his product through any more hands than necessary. In almost any of the larger towns and cities there are first-class grocers or provision dealers who supply the better class of customers, and who are in position to pay a premium over the market price for the best grade of product. The poultryman should, whenever possible, do business with such a grocer or provision dealer.

Selecting Eggs. On the other hand, in order to get and hold such a trade, the eggs which he is putting out must be first class. They should run at least twenty-four ounces to the dozen, should be uniform in size, and should be free from small cracks and from

blood spots. The only way by which the poultryman can know that his eggs are free from small cracks and blood spots is to candle them, and it is good practice for every poultryman to candle all the eggs which he produces, whether he sells them or puts them into the incubator.

Care of Container. The container which he uses should be a good one and should be clean. It should have the name of his farm stenciled on the outside. All of the fillers and flats which he uses should be clean. In other words, if a filler comes back in which an egg has been broken and the contents smeared over the filler, that filler should be destroyed.

Produce Sterile Eggs. During all of the year that is possible the poultryman should produce sterile eggs. There should not be any male birds running with the flock except during the time of actually saving eggs for hatching. As soon as this period is over the male birds should be taken out and sold.

Stamping Eggs. In order to build up a name and identify the product it is well to stamp each egg with a rubber stamp, giving the name of the farm and possibly the date

on which the egg is laid. Eggs should be sent to market as often as twice a week, because the more nearly fresh the eggs are, the better they will be and the higher price the poultryman will receive.

Home Preservation of Eggs. The poultryman should make every effort to sell to the people in his own locality as many eggs as possible for them to use for future consumption. From the poultryman's standpoint this will tend to raise the price of eggs during the time of normal low prices, as in April. From the purchaser's standpoint it will tend to lower the price of eggs during the time of low production, as in November and December. If the eggs which are preserved for home use are sterile, and are fresh when they are put down, they will keep in good shape and will serve as well as fresh eggs for ordinary cooking purposes.

How to Preserve Eggs. The preservative which is recommended by the author is water-glass. It is easy to use, is cheap, and is efficient. The material is a heavy, clear liquid, and can be obtained of drug stores. Various lots of water-glass may differ some-

what, and it is best to follow carefully the directions which the manufacturer gives. Most instructions, however, recommend one part of water-glass to ten parts of boiled and cooled water.

Care should be taken to avoid the use of any metal container; a wooden firkin or a stoneware jar should be used. The eggs may be placed in either of these containers as gathered or purchased and at least two inches of the solution should cover the eggs at all times. If some slime forms during the fall over the top of the eggs it will cause no harm.

If it is desired to boil eggs that have been preserved in water-glass, a needle may be thrust through the large end of the egg. The egg may then be boiled without the shell cracking.

Selling Eggs by Parcel Post. A comparatively recent development of the marketing end of the business has been through parcel-post deliveries. This is especially of interest to the small producer. Where a poultryman sells by parcel post, his transactions are a personal matter between himself and the consumer. Under these condi-

tions the producer naturally will make every effort possible to give to his customer the best grade of egg which he can produce. The consumer, knowing the eggs to be of the best grade and strictly fresh, and, perhaps, knowing personally the producer himself, is willing to pay a premium over the egg-market price for ordinary fresh eggs.

Containers. Various box manufacturers have developed parcel-post containers which are practical—containers which are light and at the same time strong. If such a container is used there should be but very little difficulty in using the parcel post as a means of transporting eggs.

Not Adapted to Large Plants. This method of marketing eggs is not considered practicable on the large farm, where a man is keeping twelve hundred hens or upward, because the time that would be involved in packing and caring for the large number of eggs produced on such a farm, and making them up into separate shipments, would be too great. The extra margin to be made out of this system of marketing would hardly warrant the hiring of extra help.

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CHAPTER XI. DISEASES

White Diarrhea. White diarrhea is probably the worst scourge of the chicken industry, especially in the eastern part of the United States. It is transmitted from one chick to another during the first four or five days of its life. From that time on the chick appears to be more or less immune to the disease until it reaches the adult stage. Then the disease may again be transmitted from one infected hen to another.

The principal cause and source of infection at this time is the male bird, and every effort

should be made to keep the males away from the females until two weeks before the eggs are to be saved for hatching. The male bird becomes a mechanical carrier of the infection, because the infection is not limited to the ovary of the female, but apparently passes down the oviduct and is present at the vent. Thus the male birds can spread the disease rapidly through a flock, if there is one infected female in the flock.

The following symptoms may be expected in a flock of chicks infected with white diarrhea. At time of hatching the chicks will appear normal and healthy. After three or four days certain chicks will become somewhat dumpy and will have a tendency to stay around the source of heat. A whitish or brownish-white discharge will be found stuck to the down at the vent and the chicks will make a peculiar noise whenever they attempt to void droppings.

The mortality begins usually at five days after hatching and increases rapidly day by day until the tenth to the fourteenth day, when it reaches its peak. From that time on until the chickens are three or four weeks

CHICKEN POX

ROUP

SCALY LEG

old the death rate gradually diminishes. If a post-mortem examination of the chickens is made it will be found that their entire digestive tract is practically empty, with the exception of some slimelike fluid. There is usually some part of the yolk which is undigested or unabsorbed. The lungs appear normal (a salmon pink).

Externally, the symptoms of white diarrhea and those due to chilling are the same. But on post-mortem one will find that in chickens which have been chilled there is usually some food along the digestive tract, either in the gizzard or intestines, and it will be found that the lungs are congested and of a dark garnet in color. This is the easiest way to tell the two diseases apart.

There is no positive cure for the disease. Probably the best thing that any poultryman can do when he suspects that his chicks may develop white diarrhea is to feed them all the sour skim milk or buttermilk that they will drink. This will assist, because it is a readily digested and easily assimilated food, and therefore makes the chick stronger, which, of course, helps it to combat the

disease. Either sweet or sour milk has been found to be satisfactory, but the poultryman will find that it is easier to feed the milk sour.

It is possible to eliminate this disease from a flock by the procedure known as the "agglutination method." In following this plan a blood sample is taken from each hen, the hen being marked with a numbered leg band. This sample is sent to a bacteriological laboratory and put through a certain process which discloses whether or not that particular bird is infected with the disease. If she is infected, she is at once removed from the breeding pen. It has been found that after a flock has been thus tested for several generations, and possibly two or three retests have been made in any given year, the disease can be entirely eliminated. There are several of the state colleges which are doing this work at a nominal cost, usually ten cents for each bird tested. Once the disease has been eliminated it should never appear in the flock again unless it is brought in through some outside source. If a flock is found after two or three tests to be absolutely free

from the disease, then eggs or chicks from that flock may be sold with the assurance that there is no white diarrhea present, and the purchaser should be able to grow the chicks without heavy mortality. In purchasing day-old chicks or hatching eggs every effort should be made to see that the eggs or chicks came from a flock which has been tested and found free from the disease.

Colds. Colds are more or less common, especially in rather poorly constructed or poorly ventilated henhouses. While the effects of a simple cold are seldom fatal, yet whenever the birds contract a cold the egg production is almost certain to drop. If the vitality and resistance of the birds have been lessened by colds, they are much more likely to contract other diseases, especially diseases of the respiratory system such as roup.

The symptoms of a cold are a sneezing, which can be heard especially after the birds have gone to roost at night, and a running at the nose. Usually some diarrhea is associated with it. The best cure, of course, is to remove the cause. If the house is improperly

ventilated this should be remedied. If there are any draughts in the house these should be attended to. The birds should have at once a dose of Epsom salts at the rate of three-quarters of a pound of salts to each hundred birds. Several days after the salts a dose of sulphur should be given at the rate of one pound of sulphur to each twenty pounds of mash, this mixture to be kept before the birds for five or six days.

Apparent Colds. In the fall many poultrymen find that their hens are afflicted with what appears to be a cold, in spite of the fact that the housing is well arranged, the ventilation is proper, and the birds have not been exposed to draughts. In many cases the cause of these apparent colds is the litter which is used. If fine dirt or very fine sand is used on the floor of the houses this may become very dry and dusty after the birds have been shut up for five or six weeks. The birds' breathing apparatus will be affected by fine particles, which will have the same effect upon the birds as the dust around a threshing machine will have upon a human being. The only thing to do under these

conditions is to remove the cause. On this account, the author does not believe in using anything on the floor of the henhouse for litter except shavings, straw, coarse meadow hay, or something of that kind.

Chicken Pox. Chicken pox is a disease which affects the head mostly, and is not usually fatal. It appears as small blotches, sometimes yellowish in color, upon the comb and wattles. After the disease has progressed it will be found that there are cankers inside the mouth. Frequently it appears first in the males, especially if they have been fighting, the disease apparently attacking open wounds. It may spread all over the face to the extent that both eyes may be closed tight. The best remedy for this disease is to soften and remove the scabs, using some carbolic salve to aid in softening. Then apply iodine at about the same strength as for human use. A dose of Epsom salts should be given the same as for colds, and this should be followed with a dose of sulphur as used for colds.

Coccidiosis. This disease appears usually in growing chickens, especially in chick-

ens which weigh from three to five pounds. The symptoms of the disease are a yellowish, watery discharge, or at least some peculiarly colored discharge, and a rapid emaciation, followed by apparent leg weakness.

Coccidiosis in its true form is a germ disease for which there has been developed as yet no positive cure, though some experiment stations are working on a vaccine that promises well. It has been the author's experience that the best method of handling this disease is to take all the mash away from the affected birds, giving them all the sour skim milk or buttermilk they will drink. After two or three days of starvation feed them all the scratch feed they will clean up readily. Further, the birds should be removed from the range on which they had been kept and placed on a new, thin-sodded range. The old range should be treated with a heavy coat of lime, should be plowed and reseeded. If this treatment is used the disease should not recur the following season.

If the feeding has been at fault a similar trouble is likely to develop. If the birds have been obliged to eat too great an amount

of mash or, in other words, if the scratch grain has been insufficient, this trouble is especially apt to occur. Further, if the birds have been given too great an amount of animal food, or if the mash has a content of more than 15 to 20 per cent of meat scraps or fish scraps, and if at the same time milk has been available, these birds will be very likely to develop this trouble because growing chickens or laying hens will handle only a certain amount of mash or of animal food. As was previously mentioned in the chapter on Feeding, if growing chickens have access to all the sour milk or buttermilk they will drink, the amount of meat scraps should be cut in two. The same applies to laying hens. If such a disease or trouble develops it will be well for the poultryman to follow the suggestions made above in the treatment for Coccidiosis.

Leg Weakness. Leg weakness in chickens usually develops within the first four or five weeks and, as a rule, is caused by too close confinement or too heavy a feed. If the chickens are made to go outdoors by the time they are ten days old, if they are fed

outdoors and every effort is made to keep them out, they will seldom come down with leg weakness. But if they are confined too closely, if the feed is too heavy, especially in animal protein, and also if they have too great an amount of mash, they are apt to develop typical leg weakness. The weakness is probably due to the fact that heavy feed forces growth of flesh to such an extent that the legs will not support the weight of the body.

In the case of close confinement the remedy, of course, is to get the chickens out of doors. If the cause is improper feed, remove the mash entirely, keep before the chickens a constant supply of milk, and feed liberally on hard grain or chick feed. A little bone meal added to the mash may help.

Constipation. Constipation is not at all infrequent in laying hens, especially in the late winter. Probably it is brought on by the system of feeding that is used in practically every commercial poultry plant. The modern, efficient poultryman is feeding his hens on a forcing feed all the time. This forcing feed is, of course, in a highly concentrated

form. In every flock there are occasional individuals which cannot stand up under this system of feeding, and constipation frequently follows.

This fact should cause the poultryman no alarm unless the condition spreads through the flock. If there is a general difficulty it will be observed that the droppings become hard and dry, the birds are getting out of condition, and usually a change in color of the comb and face will be noted. Just as soon as a poultryman observes this set of conditions he should give a dose of salts and, if possible, give some green feed. If he is already using green feed the thing to do is to change to some other green feed. In a word, the plan to follow is to change the feed somewhat and do everything possible to loosen the bowels. If the poultryman is not using a mash made according to an approved formula, it will be well for him to change to a formula which is approved.

Liver Diseases. There are several different liver diseases to which hens are subject, but as far as the practical poultryman is concerned they may all be classed under one

head—liver diseases. These diseases are usually brought about by improper feed: for example, feeding too much mash to the laying hens; or feeding too much protein, such as meat scraps, fish scraps, and milk. Also, indigestion or constipation may cause a similar condition.

The following are the usual symptoms: The comb of the bird usually turns dark, frequently a deep purple. Occasionally the comb turns light or pale. A post-mortem examination shows the liver to be either very much enlarged or very much shrunken. It may be spotted or marbled in appearance. It is usually pale, and in many cases is very friable or easily broken.

The best treatment for the disease is, of course, to remove the cause. However, as mentioned in the paragraphs on constipation, an occasional case of liver disease need cause no alarm. There are likely a few birds in every flock which cannot stand the modern system of feeding. If the trouble appears to be somewhat general it will be well to take the mash away from the hens for several days. Feed them rather sparingly on scratch

feed. Give them a purgative dose of salts. Mash may be given after five or six days following the dose of salts, using sulphur in the mash. Then feed heavily on scratch feed.

Eversion. This is not a true disease, but is a condition which is not at all uncommon, especially with the smaller types of hens, such as Leghorns, during the time of heavy production in March, April, and May. It is simply a turning wrong side out of the oviduct. Unless the hen is a high layer or a particularly valuable bird for any reason, the best thing to do in the case of eversion is to take the bird immediately, kill, and dress it. There is no reason why the bird should not be good to eat. If the oviduct is replaced the bird is not likely to remain normal, for the eversion is almost certain to occur again. If it has occurred two or three times the oviduct cannot be replaced permanently.

Crop Bound. The trouble known as crop bound is not at all uncommon in any poultry plant, especially if fine hay is used as litter. It is simply a case of the crop becoming filled with hay or grass or any similar substances, clogging up the opening

from the crop into the gizzard in such a way that no food will pass through. The bird, being hungry, continues to eat, until its crop becomes so full that it can hold no more. The food not passing along will eventually start to decompose, and the poisons given off will pass into the blood of the hen.

If the poultryman desires to save the hen, because of her value, it may be done by making an incision into the crop, removing the obstruction, washing the crop with some mild disinfectant, and sewing it up again. In this case probably ten days or two weeks will elapse before the crop is entirely healed, and the bird must be fed very sparingly on some watery food. This, of course, seriously influences her condition, and at least two or three weeks longer will elapse before the bird gets back into laying condition.

A bird which is crop bound should be removed from the flock as soon as the condition is noticed. Such a bird may be killed, dressed, and used for food, unless the contents of the crop have begun to spoil.

Scaly Leg. Scaly legs are caused by a mite which embeds itself under the scales of the

legs and multiplies there. It is a disease which apparently has no serious ill effect upon the hen, but which hurts her appearance. In most cases, scaly legs do not appear if the henhouse, and especially the dropping boards, have been thoroughly clean. If the trouble does develop, the best thing to do is to dip the legs of infested hens into a can containing common kerosene. Two or three applications of this treatment should kill the mites. The mites will disappear and the scales will return to a normal condition.

Roup. Roup is not as common or prevalent in the present-day poultry house as it was in the old, closed henhouse. It is a disease which may be considered as an after-effect of a cold. The eyes run, there is a discharge from the nostrils which is sticky, the eyes may later fill up with a puslike discharge and may become entirely closed; there is very likely to be canker or yellowish-white growths inside the mouth.

The best method of treatment is prevention, by having a sufficient quantity of fresh air coming into the henhouse through the open fronts. But if, in spite of this, the

disease attacks the birds, the affected birds should be removed from the flock and should be killed and burned.

While it is not impossible to cure roup, yet in the average commercial plant it is extremely difficult, because, while the disease may apparently be cured, it is likely to break out again at any time. If the individual bird affected is a valuable one, or if the disease is present in only one or two instances, it may be well to resort to individual treatment. If this is the case, the following is recommended:

Wash the outside of the face, all around the eyes, with a mild disinfectant such as hydrogen-peroxide or a weak solution of carbolic acid. Take the bird's head and dip it into the solution, holding it there for an instant. Give the bird a small dose of salts—perhaps half a teaspoonful to the hen. Keep in a warm, dry place and give a little hard grain, but only a little.

THE END

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